

AD-A230 994

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM - PHASE 2
BY SERVICE
FISCAL YEAR 1987
ARMY

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ADIABATICS INC
630 S MAPLETON ST
COLUMBUS, IN 47201
CONTRACT NUMBER: DAAE07-87-C-8057
ROY KAMO

TITLE:

STOICHIOMETRIC DIESEL ENGINE
TOPIC# 161 OFFICE: TACOM

IDENT#: 17377

A CONCEPT DEMONSTRATION OF A STOICHIOMETRIC DIESEL ENGINE IS PROPOSED USING THE CONCEPTS FOR STOICHIOMETRIC COMBUSTION INVESTIGATED IN THE PHASE I EFFORT. THE CONCLUSION DRAWN FROM PHASE I IS THAT THE STOICHIOMETRIC DIESEL ENGINE HAS SIGNIFICANT SIZE AND WEIGHT ADVANTAGES OVER CONVENTIONAL DIESEL ENGINES AND IS PRACTICAL TO IMPLEMENT UTILIZING TODAY'S STATE-OF-THE-ART INSULATED DIESEL ENGINE COMPONENT TECHNOLOGY. A PHASE II PROJECT IS PROPOSED CONSISTING OF SIX TASKS TO SELECT AN APPROACH AND A TEST ENGINE FOLLOWED BY DESIGN AND PROCUREMENT AND COMPLETED WITH THE RUNNING OF ENGINE TESTS. CONVENTIONAL DIESEL ENGINES OPERATE WITH A LARGE AMOUNT OF EXCESS AIR AS COMPARED WITH GASOLINE ENGINES WHICH OPERATE WITH NO EXCESS AIR (STOICHIOMETRIC) AND THEREFORE GASOLINE ENGINES DELIVER ABOUT TWICE AS MUCH POWER AS THE DIESEL ENGINE. THE ANALYSIS CONDUCTED IN PHASE I SHOWED THAT THE USE OF AN INSULATED HIGH TEMPERATURE PRE-COMBUSTION CHAMBER SPEEDS UP THE MIXING AND PREPARATION OF THE FUEL AIR MIXTURE SUFFICIENTLY THAT IT COMBUSTS LIKE A PRE-MIXED HOMOGENEOUS CHARGE. ENGINE PERFORMANCE DATA INCLUDING POWER OUTPUT, FUEL CONSUMPTION AND EMISSIONS WILL BE GATHERED BY RUNNING A STOICHIOMETRIC DIESEL ENGINE.

ADVANCED COMPOSITE PRODUCTS INC
21 COMMERCE DR
NORTH BRANFORD, CT 06471
CONTRACT NUMBER: DAAJ02-87-C-0007
DAVID MAASS

TITLE:

DEVELOPMENT OF SELF HEATED HIGH TEMPERATURE TOOLING FOR THERMOPLASTIC COMPOSITE HELICOPTER STRUCTURES

TOPIC# 31 OFFICE: AVSCOM IDENT#: 17278

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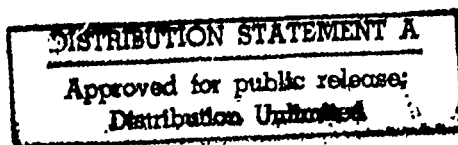
PREFACE

From those Phase II proposals submitted by small research and development (R&D) firms awarded Phase I contracts under the FY 1987 Solicitation, the Department of Defense (DoD) Components have selected 449 proposals for funding. The selection and award process began in FY 1988 and continued through FY 1990.

In order to make information available on the technical content of the Phase II projects supported by the DoD SBIR Program, this report presents the abstracts of those proposals which have resulted in contract awards. Further, the name and address of each firm performing the work is given for those who may desire additional information about the project. Projects appearing with an asterisk (*) at the beginning of the abstract indicated it is a Phase I abstract and that Phase II negotiations were not complete when this publication went to press.

Venture capital and large industrial firms that may have an interest in the research described in the abstracts in this publication are encouraged to contact the SBIR firm whose name and address are shown.

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INTRODUCTION

On July 22, 1982 the President signed the "Small Business Innovation Development Act of 1982" (Public Law 97-219). This law became effective October 1, 1982 and was designed to give small high technology firms a greater share of Federal R&D contract awards.

The SBIR Program consists of three distinct phases. Under Phase I, DoD Components make awards to small businesses, typically of one-half to one man-year effort over a period generally not to exceed six months, subject to negotiation. Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas or concepts submitted in response to SBIR topics. All DoD topics address specific R&D needs to improve our defense posture. Proposals selected for contract award are those which contain an approach or idea that holds promise to provide an answer to the specific problem addressed in the topic. The successful completion of Phase I is a prerequisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. In addition, proposals which identify a follow-on Phase III funding commitment from non-Federal sources will be given special consideration. Phase II awards will typically cover two to five man-years of effort over a period generally not to exceed 24 months, also subject to negotiation. The number of Phase II awards will depend upon the success rate of the Phase I effort and availability of funds. Phase II is the principal research or R&D effort, and will require a more comprehensive proposal which outlines the intended effort in detail.

Phase III is expected to involve private-sector investment and support for any necessary development that will bring an innovation to the marketplace. Also, under Phase III, DoD may award follow-on contracts not funded by the SBIR Program for products or processes meeting DoD mission needs.

Selection Criteria

Phase II proposals received in each topic area in the DoD solicitation brochure are evaluated on a competitive basis in the organization which generated the topic, by scientists and engineers knowledgeable in that area and in accordance with the following criteria:

- a. Anticipated benefits of the research or development to the total DoD R&D effort,
- b. Scientific/technical quality of the proposal, with special emphasis on its innovation and originality.

c. Qualifications of the principal investigator and other key personnel to carry out the proposed work,

d. Degree to which the Phase I objectives were met at the time of Phase II proposal submission, *and*

e. Adequacy of the Phase II objectives to meet the opportunity or solve the problem. *4*

Public Law 99-443, the "Small Business Innovation Act of 1986" was signed by the President on October 6, 1986. This law re-authorized P.L. 97-219 to extend the "Sunset Clause" to 1993; to continue 1.25 percent taxation of the extramural research and development budget; and excludes from taxation those amounts of the DoD research and development budget obligated solely for operational systems development.

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IN A PHASE I CONTRACT, ACP DEMONSTRATED THAT FABRICS MADE FROM COMMINGLED THERMOPLASTIC COMPOSITE YARNS COULD BE USED TO FABRICATE COMPLEX INTEGRATED HELICOPTER STRUCTURE. THIS OFFERS THE POTENTIAL FOR LOW COST, DAMAGE TOLERANT AIRFRAME STRUCTURE IN UPCOMING APPLICATIONS SUCH AS LHX. HOWEVER, ONE OF THE CURRENT LIMITS TO ACHIEVING THIS GOAL HAS BEEN THE DESIGN, FABRICATION, AND OPERATION OF COST-EFFECTIVE, HIGH QUALITY, HIGH TEMPERATURE TOOLING. THE OBJECTIVE OF THIS PHASE II PROGRAM, THEN, IS TO REFINE AND DEMONSTRATE THE MOST PROMISING TECHNOLOGY IN SELF-HEATED, HIGH TEMPERATURE TOOLING FOR THERMOPLASTIC COMPOSITE PROCESSING.

ADVANCED DECISION SYSTEMS
201 SAN ANTONIO CIR - STE 286
MOUNTAIN VIEW, CA 94940
CONTRACT NUMBER: DAAE07-87-C-R054
RANDAL WALSER

TITLE:

TEAMS-WORKS II

TOPIC# 158 OFFICE: TACOM IDENT#: 17374

ADS IS PROPOSING TO CONTINUE THE CONSTRUCTION OF TEAM-WORKS, A DISTRIBUTED LABORATORY FOR THE INTERACTIVE SIMULATION OF PLATOON-LEVEL TELEROBOTIC COMBAT. THE LABORATORY WILL BE USED BROADLY FOR THE VISUALIZATION AND DEVELOPMENT OF TELEROBOTIC CONCEPTS, TACTICS, AND MISSIONS. SCIENTISTS WILL USE THE LABORATORY TO CONDUCT EXPERIMENTS IN ARTIFICIAL INTELLIGENCE, USER INTERFACE DESIGN, AND GROUP BEHAVIOR. ENGINEERS WILL USE IT TO ENVISION, EVALUATE, AND PROMOTE NEW CONCEPTS. SOLDIERS WILL USE IT TO DEVISE NEW TACTICS, AND TO TRAIN FOR, PLAN, AND REHEARSE TELEROBOTIC MISSIONS. DURING PHASE I, ADS DESIGNED AND PARTIALLY IMPLEMENTED AN INTERACTIVE, MULTI-PLAYER SYSTEM, BASED ON AN INEXPENSIVE NETWORK OF PERSONAL COMPUTER WORKSTATIONS, FOR SIMULATING BATTLES BETWEEN MANNED AND TELEROBOTIC PLATOONS. DURING PHASE II, WE PLAN TO COMPLETE TEAM WORKS' INFRASTRUCTURE AND THEN USE IT TO DEVISE A SUPERVISORY CONTROL SYSTEM, CALLED TEAM-MATE, WHICH A COMMANDER WILL USE TO COORDINATE THE ACTIVITIES OF FOUR SIMULATED TELEROBOTIC COMBAT VEHICLES. TEAM-MATE WILL "PUSH" DEVELOPMENT OF THE LABORATORY AND THE LABORATORY WILL "PULL" DEVELOPMENT OF TEAM-MATE. BESIDES TEAM-MATE

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AND THE LABORATORY'S INFRASTRUCTURE, THE PROJECT WILL ALSO DELIVER TWO INTERACTIVE SIMULATIONS, RELATED INTERACTIVE SCENARIOS, TWO VIDEOTAPES, AND A LANGUAGE FOR PROGRAMMING THE PARALLEL ACTIVITIES OF MULTIPLE AGENTS..

ADVANCED DECISION SYSTEMS
1500 PLYMOUTH ST
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER: DAAB07-87-C-A044
RICHARD F SHU
TITLE:
TERRAIN ANALYSIS SYSTEM (TAS)
TOPIC# 300 OFFICE: CECOM/CA IDENT#: 17416

OVER THE PAST DECADE, THE COSTS OF COMPUTER GRAPHICS DISPLAYS, COMPUTER PROCESSORS AND SECONDARY STORAGE HAVE DROPPED DRAMATICALLY. AS A RESULT, THERE IS A RAPIDLY GROWING INTEREST IN GEOGRAPHIC INFORMATION SYSTEMS (GIS) BOTH WITHIN AND WITHOUT THE DOD COMMUNITY. ONE OF THE MAJOR DIFFICULTIES HINDERING GROWTH OF GIS SYSTEMS IS THE LEVEL OF DETAIL REQUIRED IN THEIR USER INTERFACES. ALMOST EVERY GIS REQUIRES QUERIES TO BE EXPRESSED IN A FORMAL QUERY LANGUAGE WHOSE DOMAIN IS THAT OF SPATIAL OBJECTS. THIS RESULTS IN A USER INTERFACE WHICH IS DIFFICULT TO USE. THE OBJECTIVE OF THE TAS PROJECT IS TO DESIGN AND IMPLEMENT A SYSTEM WHICH ALLOWS THE USER TO EXPRESS QUERIES IN TERMS OF THE DOMAIN OF MILITARY TACTICS RATHER THAN JUST THOSE OF SPATIAL OBJECTS. IN PHASE I, SYSTEM REQUIREMENTS WERE IDENTIFIED AND A TOP-LEVEL DESIGN WAS DEVELOPED. IN PHASE II, WE PROPOSE TO ELABORATE THE DETAILED DESIGN AND IMPLEMENT A PROTOTYPE WHICH CAN BE TRANSITIONED INTO AN ARMY LABORATORY (E.G., CECOM) OR AN ARMY PROGRAM MANAGER.

ADVANCED TECHNOLOGY & RESEARCH INC
14900 SWEITZER LN
LAUREL, MD 20707
CONTRACT NUMBER: DAAD05-87-C-0137
VALMORE F DeVOST
TITLE:
MECHANICAL SHOCK SENSORS
TOPIC# 184 OFFICE: TECOM IDENT#: 18211

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PHASE I RESULTS INDICATED THE FEASIBILITY OF USING COPPER BALLS AND PYROTECHNIC CAPS AS SENSORS TO CHARACTERIZE HIGH-G, SHORT DURATION SHOCK PULSES. PHASE II WILL BE CONCERNED WITH THE ENGINEERING DEVELOPMENT OF A UNIT INCORPORATING A NUMBER OF EACH SENSOR WITH DIFFERENT SENSITIVITIES. STUDIES CONCERNED WITH THE EFFECTS ON SENSITIVITY OF SHOCK FREQUENCY, AMPLITUDE AND ORIENTATION AS WELL AS EFFECTS OF TEMPERATURE WILL BE CONDUCTED. THE RESULTS OF THE STUDIES WILL BE USED TO PREPARE DESIGN DISCLOSURES WHICH, IN TURN, WILL BE USED TO PROCURE 10 UNITS. THESE UNITS WILL BE THOROUGHLY EVALUATED. THE CULMINATION OF THE PROJECT WILL BE A PROVEN DESIGN DISCLOSURE PACKAGE WITH QUALITY ASSURANCE PROVISIONS THAT IS SUITABLE FOR FABRICATING THE UNIT. THE UNIT WILL BE INEXPENSIVE, EASY TO ASSEMBLE, AND EASY TO USE.

AEROMETRICS INC
894 ROSS DR - UNIT 105
SUNNYVALE, CA 94089
CONTRACT NUMBER: DACA33-87-C-0047
DR WILLIAM D BACHALO

TITLE:

DEVELOPMENT OF ADVANCED INSTRUMENTATION FOR DROP SIZE AND LIQUID WATER CONTENT MEASUREMENTS IN CLOUDS

TOPIC# 260 OFFICE: CRREL IDENT#: 17347

DEVELOPMENT OF A PORTABLE AND RUGGED PROBE FOR THE DETERMINATION OF DROP SIZE AND VELOCITY DISTRIBUTIONS AS WELL AS THE LIQUID WATER CONTENT OF FOG, CLOUDS, POWER PLANT EFFLUENTS, SHIPBOARD SPRAYS, AND OTHER APPLICATIONS IS THE OBJECTIVE OF THIS PROGRAM. CURRENTLY, THE METHODOLOGIES FOR MEASURING DROP SIZE DISTRIBUTIONS AND LWC ARE TIME-CONSUMING AND LACK ACCURACY, RELIABILITY, AND VERSATILITY. UNDER THE PHASE I PROGRAM, THE AEROMETRICS PHASE DOPPLER PARTICLE ANALYZER (PDPA) WAS EVALUATED AS ADVANCED DIAGNOSTIC THAT COULD PROVIDE THE NECESSARY MEASUREMENTS WITH EMPHASIS PLACED ON THE LWC DATA. BASED ON COMPARISONS WITH OTHER METHODS, THE RESULTS SHOWED GOOD AGREEMENT. A COMPACT FIBER OPTIC PROBE WAS DEVELOPED AND EVALUATED BY COMPARISON WITH THE PROVEN PERFORMANCE OF THE STANDARD PDPA INSTRUMENT. THE METHOD SHOWED EXCEPTIONAL PROMISE AS A FIELD PORTABLE PROBE. THE PHASE II PROGRAM WILL FOCUS ON THE DEVELOPMENT

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OF THE COMPACT FIELD PORTABLE PROBE. ALTHOUGH THE USE OF FIBER OPTICS HAS MANY ADVANTAGES, SOLID STATE AND DEVICES WILL BE CONSIDERED BEFORE PROCEEDING WITH THE DEVELOPMENT. A PROTOTYPE PROBE WILL BE BUILT AND FULLY TESTED IN A RANGE OF SIMULATED ENVIRONMENTS. BASED UPON THE RESULTS OF THESE TESTS, THE PROBE DESIGN WILL BE REFINED TO MEET THE MEASUREMENT REQUIREMENTS. THE PROBE WILL THEN BE DELIVERED TO CRREL FOR FURTHER TESTING IN REALISTIC CONDITIONS.

AMERICAN RESEARCH CORP OF VA
PO BOX 3406 - 642 FIRST ST
RADFORD, VA 24143
CONTRACT NUMBER: DAAD05-87-C-0029
DR M G NIIMURA

TITLE:
TUNABLE-WAVELENGTH COMPACT MILLIMETER WAVE RADAR FOR CLOUD
MAPPING
TOPIC# 196 OFFICE: TECOM IDENT#: 15244

ALTHOUGH THE USE OF SHORTER WAVELENGTHS IMPROVES ANGULAR RESOLUTION, RADAR SIGNALS ATTENUATE QUICKLY AT THE SURFACE OF THE CLOUD/SMOKE SINCE THE ELECTROMAGNETIC SKIN-DEPTH IS PROPORTIONAL TO THE WAVELENGTH. IN ORDER TO RECORD THE INTERNAL STRUCTURE OF CLOUD/SMOKE, IT IS ESSENTIAL TO USE TUNABLE WAVELENGTH SOURCES, ESPECIALLY FOR RANGING OBJECTS WITHIN THE CLOUD/SMOKE. SINCE THE ATTENUATION COEFFICIENT OF SMOKE OBSCURANT CLOUDS IS DIFFERENT FROM THAT OF WATER VAPOR CLOUDS AND VARIES FOR DIFFERENT KINDS OF SMOKE, THE OPTIMUM RADAR FREQUENCIES TO GIVE THE MAXIMUM SIGNAL-TO-NOISE RATIO ARE PROBABLY DIFFERENT FROM THOSE OF THE ATMOSPHERIC WINDOWS AT 35 AND 94 GHz, THEREBY REQUIRING A WIDE-BAND VARIABLE FREQUENCY SOURCE FOR CLOUD MAPPING. SUCH A SOURCE IS ALSO NECESSARY FOR DERIVING THE THEORETICAL CURVE OF ATTENUATION SPECTRUM FOR EACH KIND OF SMOKE. THE PHASE I PROGRAM HAS SUCCEEDED IN DEVELOPING A BATTERY-POWERED, WIND-RANGE HIGH VOLTAGE SUPPLY FOR WIDE-BAND FREQUENCY (~ 1000 GHz) TUNING OF AN ORBITRON RADAR SOURCE. MILLIMETER-WAVE OUTPUT WAS CONSERVATIVELY MEASURED TO BE 6.7 W ONLY AT THE V-BAND (50-75 GHz) AND FROM A SMALL (1.5" DIA., 6" LONG) ORBITRON TUBE. PHASE II EFFORTS INCLUDE EXTENSION OF mm-WAVE AND SMOKE INTERACTION THEORY AND RELATED EXPERIMENTS, OPTIMIZATION OF PHASE I INSTRUMENT SYSTEM,

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DEVELOPMENT OF mm-WAVE DIAGNOSTIC TECHNIQUES, DEVELOPMENT OF HIGH DIRECTIVE POWER ORBITRON MASERS, CONSTRUCTION OF MULTI-CHANNEL AND ELECTRONICALLY TUNABLE VARIABLE WAVELENGTH ORBITRON MASERS, AND ACQUISITION OF TEST DATA. ANTICIPATED RESULTS INCLUDE IDENTIFICATION OF ATTENUATION SPECTRA FROM SPECIFIED TYPES OF SMOKE, ENHANCED DIRECTIVE RADAR POWER FROM HIGH EFFICIENCY ORBITRON TUBES, THEORETICAL EXPLANATION OF ORBITRON MASER ACTION MECHANISM AND DEVELOPMENT OF MULTI-CHANNEL RADAR AND A COMPACT SWEEP-FREQUENCY RADAR SYSTEM.

ANACAPA SCIENCES INC
901 OLIVE ST
SANTA BARBARA, CA 93101
CONTRACT NUMBER: DAAB07-87-C-A045
DR JAMES GEIWITZ

TITLE:
KNOWLEDGE ACQUISITION TECHNIQUES FOR KNOWLEDGE BASED SYSTEMS
TOPIC# 300 OFFICE: C/A IDENT#: 17417

THIS PROPOSAL SEEKS TO CONTINUE THE PHASE I RESEARCH ON KNOWLEDGE-ACQUISITION TECHNIQUES FOR KNOWLEDGE-BASED (EXPERT) SYSTEMS. THE GENERAL OBJECTIVE WILL BE PURSUED IN TERMS OF THREE SPECIFIC OBJECTIVES: (i) TO DEVELOP A CONCEPTUAL MODEL OF THE KNOWLEDGE-ACQUISITION PROCESS, WITH PARTICULAR EMPHASIS ON THE DIMENSIONS ON WHICH KNOWLEDGE-ACQUISITION TECHNIQUES CAN BE EVALUATED AND SELECTED. (ii) TO COMPARE EXPERIMENTALLY DIFFERENT TECHNIQUES FOR KNOWLEDGE ACQUISITION, IN THOSE CASES WHERE EMPIRICAL DATA ARE REQUIRED TO ASSIGN THE TECHNIQUES TO APPROPRIATE LOCATIONS IN THE N-DIMENSIONAL SPACE OF OUR CONCEPTUAL MODEL. THESE EXPERIMENTS WILL PRODUCE TWO OR MORE MINIATURE KNOWLEDGE-BASED SYSTEMS FOR USE BY OPERATIONAL UNITS OF THE US ARMY, AND A TESTBED FOR PROTOTYPE EXPERT SYSTEMS THAT CAN BE USED FOR FURTHER RESEARCH ON KNOWLEDGE ACQUISITION OR OTHER ASPECTS OF EXPERT-SYSTEM DEVELOPMENT. (iii) TO DEVELOP GUIDELINES FOR THE EFFICIENT SELECTION OF AN EFFECTIVE TECHNIQUE, GIVEN THE PROBLEM DOMAIN, THE USER'S PURPOSE, AND VALUES ON OTHER DIMENSIONS IDENTIFIED BY THE CONCEPTUAL MODEL AS DETERMINANTS ON THE BEST POSSIBLE TECHNIQUE. THESE GUIDELINES WILL BE IMPLEMENTED BOTH AS A PAPER GUIDEBOOK AND AS A KNOWLEDGE-BASED SYSTEM.

ANALYSIS & SIMULATION INC
1 AMERICAN DR
BUFFALO, NY 14225
CONTRACT NUMBER: DAAJ02-87-C-0014
PAUL PATTI

TITLE:
MULTI-ROTORCRAFT MULTI-THREAT AIR-TO-GROUND ENGAGEMENT
SIMULATION
TOPIC# 35 OFFICE: AVSCOM IDENT#: 17282

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IN PHASE I OF THE EFFORT, AN-SIM DEMONSTRATED THE ABILITY TO INCORPORATE THE EFFECTS OF ROTORCRAFT NOE FLIGHT IN AN AIR/GROUND COMBAT SIMULATION BY MEANS OF STOCHASTIC TERRAIN REPRESENTATION. FOR PHASE II, AN-SIM WILL PROCEED WITH DEVELOPMENT AND DEMONSTRATION OF A MICROCOMPUTER-BASED MANY-ON-MANY AIR/GROUND SIMULATION THAT MEETS THE NEEDS OF ROTORCRAFT DEVELOPERS FOR PERFORMING UTILITY EFFECTIVENESS, AND SURVIVABILITY ANALYSES DURING THE REQUIREMENTS, CONCEPT(S), AND DESIGN DEFINITION PHASES OF ROTORCRAFT SYSTEMS DEVELOPMENT. THE REALISM OF THE SIMULATION WILL BE ENHANCED BY INCORPORATION OF THE INTERACTION BETWEEN THE COMBATANTS AND THE NOE OPERATIONAL ENVIRONMENT WHILE ITS UTILITY WILL BE ENHANCED BY AN APPROACH WHICH POSSESSES THE SENSITIVITY NEEDED FOR SYSTEM AND SUBSYSTEM TRADEOFF ANALYSES WHILE HAVING SUFFICIENT COMPREHENSIVENESS TO ENCOMPASS THE MANY FUNCTIONAL SYSTEMS INVOLVED.

ANALYTICAL METHODS INC

PO BOX 3786

BELLEVUE, WA 98009

CONTRACT NUMBER: DAAL03-87-C-0011

DAVID R CLARK

TITLE:

DEVELOPMENT OF A PANEL METHOD FOR MODELING CONFIGURATIONS WITH UNSTEADY COMPONENT MOTIONS

TOPIC# 115 OFFICE: ARO/LABCOM IDENT#: 15069

THIS PROPOSAL COVERS WORK IN THE SECOND PHASE OF A STUDY WHICH WILL PROVIDE A PRACTICAL ANALYSIS CAPABLE OF CALCULATING THE FLOW AROUND AND THE LOADS ON CONFIGURATIONS WHERE ELEMENTS OF THE VEHICLE ARE IN MOTION RELATIVE TO EACH OTHER AND WHERE THE VEHICLE MAY BE IN UNSTEADY MOTION IN THE INERTIAL FRAME. A WIDE RANGE OF PROBLEMS FALL INTO THIS CATEGORY WITH HELICOPTER BLADE/FUSELAGE INTERFERENCE BEING ONLY ONE EXAMPLE. IN THE FIRST PHASE OF THE STUDY THE VIABILITY OF A PANEL METHOD AS A WAY OF PREDICTING UNSTEADY LOADS WAS DEMONSTRATED. IN THIS PHASE, THE ANALYSIS WILL BE EXPANDED TO INCLUDE EFFECTS SUCH AS BLADE MOTIONS, BLADE ELASTIC DEFLECTIONS, ROTOR CONTROL AND VEHICLE TRIM INPUTS. DEVELOPMENT OF THE ANALYSIS AT THE BASIC LEVEL WILL ALSO CONTINUE WITH THE WAKE CUTTING MODELS IDENTIFIED IN PHASE I BEING INCORPORATED AND THE EFFECTS AND COMPRESSIBILITY AND LOCALLY

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TRANSONIC FLOW ACCOMMODATED BY USING A FIELD SINGULARITY. THE FINAL GOAL OF THE PHASE II WORK IS PRACTICAL ENGINEERING ANALYSIS WHICH CAN BE USED WITH CONFIDENCE IN PHASE III TO DEVELOP ROTORCRAFT SYSTEMS DESIGNED FOR REDUCED DYNAMIC LOADS WITH, AS A RESULT, LOWER VIBRATION LEVELS, LESS NOISE, LONGER COMPONENT LIFE AND REDUCED LIFE CYCLE COST.

ANALYTICS INC
2500 MARYLAND RD
WILLOW GROVE, PA 19090
CONTRACT NUMBER: DAAB07-87-C-P033
ROBERT J LYSAGHT
TITLE:
DEVELOPMENT OF A FUNCTIONAL PROTOTYPE ARMY COMBAT ENGINEER
(ACE) ASSISTANT SYSTEM
TOPIC# 300 OFFICE: CECOM IDENT#: 19955

THE FEASIBILITY OF DEVELOPING A DECISION-AIDING SUPPORT SYSTEM FOR COMBAT ENGINEERS THAT SUPPORTS PLANNING ACTIVITIES WITH RESPECT TO COUNTERMOBILITY, MOBILITY, AND SURVIVABILITY ACTIVITIES WAS INVESTIGATED IN A PHASE I RESEARCH PROGRAM. THE RESEARCH AND ANALYSES HAVE SHOWN: 1) COMBAT ENGINEERS ARE FACED WITH A COMPLEX DECISION SITUATION WHEREBY THE COMBAT ENGINEER IS STRIVING TO SUPPORT THE OPERATIONAL NEEDS OF THE TACTICAL COMMANDER WITHIN THE CONTEXT OF LIMITED ENGINEERING ASSETS AS WELL AS TIME CONSTRAINTS; 2) AN INTERACTIVE DECISION-AIDING SUPPORT SYSTEM IS WARRANTED TO AUGMENT THE COMBAT ENGINEER'S DECISION-MAKING PROCESS WITH RESPECT TO DEVELOPING PLANS TO SUPPORT TACTICAL MISSION OBJECTIVES; AND 3) TECHNOLOGY EXISTS TODAY SUCH THAT A MULTIPLE-ANALYSIS DECISION AID IS FEASIBLE WHICH WILL UTILIZE A COMBINATION OF GRAPHICAL, STATISTICAL AND HEURISTIC TECHNIQUES. THE PHASE II DEVELOPMENT OF A PROTOTYPE ARMY COMBAT ENGINEER (ACE) ASSISTANT SYSTEM IS THE SUBJECT OF THIS PROPOSAL. THE PRINCIPAL OBJECTIVE OF THE PHASE II RESEARCH IS TO DEMONSTRATE PROOF-OF-CONCEPT THROUGH THE DEVELOPMENT OF A FUNCTIONAL PROTOTYPE ACE ASSISTANT TO ENHANCE COMBAT ENGINEER'S ABILITY TO PRODUCE EFFECTIVE AND TIMELY ENGINEER OPERATIONAL PLANS. OUR APPROACH TO MEETING THESE OBJECTIVES INCLUDES RAPID PROTOTYPING FOR SOFTWARE DEVELOPMENT AND EXTENSIVE TESTING TO VERIFY BOTH SOFTWARE ALGORITHMS AND INTERFACE USABILITY IN THE CONTEXT OF DETAILED MISSION SCENARIOS.

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THE FULLY FUNCTIONAL PROTOTYPE SYSTEM WILL BE DEMONSTRATED AT THE
COMPLETION OF DEVELOPMENT.

ANRO ENGINEERING CONSULTANTS INC
5 MILITIA DR - STE 104
LEXINGTON, MA 02173
CONTRACT NUMBER: DAAD05-87-C-0115

DAVID K BARTON

TITLE:

RADAR EVALUATION HANDBOOK

TOPIC# 232 OFFICE: TECOM

IDENT#: 17361

MOST OF THE TECHNICAL LITERATURE IN RADAR IS WRITTEN FOR SPECIALIST PROFESSIONALS IN THAT FIELD. THE PROPOSED RADAR EVALUATION HANDBOOK WILL CONTAIN TECHNICAL DATA AND PROCEDURES FOR RADAR EVALUATION, BUT WILL BE ADDRESSED TO THE NEEDS OF THE GENERALISTS FOR WHOM RADAR IS ONLY ONE OF THE MANY TECHNICAL DISCIPLINES NEEDED IN THEIR WORK. THE DETAILED TECHNICAL BASIS FOR THE MATERIAL WILL BE CONTAINED IN THE NEW TEXT, MODERN RADAR SYSTEM ANALYSIS, BY DAVID K. BARTON, IN THE FINAL STAGES OF PRODUCTION AND SCHEDULED FOR RELEASE IN JUNE 1988. SUMMARY MATERIAL BASED ON THAT TEXT HAS BEEN PREPARED DURING PHASE I, IN THE FORM OF DRAFTS OF TWO CHAPTERS OF THE HANDBOOK: CHAPTER 1. INTRODUCTION AND RADAR FUNDAMENTALS, CHAPTER 2. RADAR SYSTEM DESIGN. THIS MATERIAL HAS BEEN REVIEWED BOTH INTERNALLY AND BY ARMY PERSONNEL, FOR CLARITY AND USEFULNESS, AND THE REVISIONS HAVE BEEN INCORPORATED IN CHAPTER 1. CHAPTER 2 WILL BE REVISED IN FINAL FORM DURING THE PHASE II EFFORT. THE REMAINING CHAPTERS, COVERING THEORY, PRACTICE AND PRINCIPLES OF TESTING AND EVALUATION, WILL BE PREPARED, REVIEWED, REVISED AND PLACED IN CAMERA-READY FORM FOR PUBLICATION. THE HANDBOOK WILL COVER TYPES OF RADAR USED BY THE U.S. ARMY IN ALL FREQUENCY BANDS FOR SURVEILLANCE, TRACKING, GUIDANCE AND INSTRUMENTATION.

ANTECH INC
788 MYRTLE ST
ROSWELL, GA 30075
CONTRACT NUMBER:
ASHOK K NAGRANI

TITLE:

DESIGN AND BUILD A COMPUTERIZED DEVICE TO AUTOMATICALLY
CREATE AS-BUILT DRAWINGS IN CAD SYSTEM

TOPIC# 255 OFFICE: CERL

IDENT#: 17131

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IN PHASE I OF THE SBIR AWARD, ANTECH, INC. RESEARCHED SEVERAL DIFFERENT WAYS OF SCANNING FIELD DATA QUICKLY AND ACCURATELY, SUCH THAT THIS DATA COULD BE EASILY USED TO CREATE DRAWINGS OF AS-BUILT STRUCTURES IN A CAD SYSTEM. USING AN OFF-THE-SHELF INFRARED THEODOLITE ELECTRONIC TOTAL STATION (ETS) USED BY SURVEYORS, WE SUCCESSFULLY INTEGRATED THE ETS WITH A LAPTOP COMPUTER TO ACCURATELY CAPTURE THE DATA. SOFTWARE ROUTINES WERE WRITTEN TO CONVERT THE DATA CAPTURED INTO A FORMAT THAT COULD BE READ BY AUTOCAD, THE MOST POPULAR CAD SOFTWARE. AUTOLISP ROUTINES WERE WRITTEN WITHIN THE CAD PROGRAM TO CONVERT THE DATA INTO BUILDING DRAWINGS. WE SUCCESSFULLY DEMONSTRATED THAT WITH A MINIMUM OF EFFORT, A FIELD SURVEYOR WORKING ALONE COULD EASILY CAPTURE THE REQUIRED DATA, AND VIEW THE DRAWING WHILE STILL IN THE FIELD. ONLY MINOR TOUCH UP OF THE DRAWINGS WOULD BE REQUIRED TO CREATE WORKING CAD DRAWINGS ON AN OFFICE DESKTOP COMPUTER. THE PROPOSED AS-BUILT DRAWING CREATOR (ABDC) CONSISTS OF FOUR COMPONENTS: (1) THE MEASURING DEVICE WILL BE AN ETS, SIMILAR TO THE ONE USED IN PHASE I, (2) THE DATA COLLECTOR AND REDUCTION DEVICE WILL BE A LAPTOP OR HAND-HELD COMPUTER, (3) A MOVEABLE DOLLY TO HOUSE THE ETS AND LAPTOP COMPUTER, (4) SOFTWARE TO CAPTURE THE DATA AND CONVERT INTO A DRAWING IN CAD IN REAL-TIME. THE TECHNICAL OBJECTIVES THAT ANTECH WILL MEET IN IMPLEMENTING PHASE II ARE THREEFOLD: (1) A SUITABLE LAPTOP OR HAND-HELD COMPUTER WILL BE SELECTED AND CONFIGURED SUCH THAT IT CAN RUN A CAD PROGRAM IN REAL-TIME. (2) SOFTWARE WILL BE WRITTEN TO ALLOW THE CAPTURE AND VISUALIZATION OF DATA AS IT IS BEING MEASURED. (3) THE DOLLY WILL BE DESIGNED FOR EFFICIENT USAGE BY FIELD OPERATORS AND BE AMENABLE TO QUANTIFY PRODUCTION.

APA OPTICS INC
2950 NE - 84TH LN
BLAINE, MN 55432
CONTRACT NUMBER: DAAA15-87-C-0059
DR W T BOORD
TITLE:
INTEGRATED OPTIC LASER SCANNER DISPLAY GENERATION
TOPIC# 89 OFFICE: BRL IDENT#: 16186

SOME APPLICATIONS OF CATHODE RAY TUBES TO PRODUCE IMAGERY SEVERELY

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PENALIZE THE DISPLAY SYSTEM BECAUSE OF SIZE, RELIABILITY, AND COST. ALTERNATE DISPLAY MEDIA HAVE SIGNIFICANT LIMITATIONS, SUCH AS SLOW FRAME RATES AND A SMALL RANGE OF GRAY LEVELS. THE OBJECTIVE OF THIS PROGRAM IS TO DEMONSTRATE A TWO DIMENSIONAL DISPLAY GENERATED BY A SCANNED LASER BEAM. THE UNIQUE ELEMENT OF THE LASER GENERATED DISPLAY IS AN INTEGRATED OPTIC DEVICE WHICH SCANS A LASER BEAM WITHOUT THE NEED FOR MOVING PARTS. THE PHASE II PROGRAM WILL DEVELOP ELECTRO-OPTICALLY CONTROLLED WAVEGUIDE OUTPUT COUPLERS WHICH ARE BOTH THE UNIQUE AND KEY COMPONENT OF THE PROPOSED DEVICE. THE ELECTRICALLY CONTROLLED OUTPUT COUPLER WILL THEN BE INTEGRATED WITH ELECTRO-OPTIC BRAGG DIFFRACTION GRATINGS TO PRODUCE A TWO DIMENSION LASER BEAM SCANNING CAPABILITY. USING A LASER BEAM TO ILLUMINATE THE DISPLAY PIXELS WILL PERMIT GENERATION OF A WIDE RANGE OF GRAY LEVELS BY MODULATING THE INTENSITY OF THE LASER BEAM. UTILIZING THE ELECTRO-OPTIC EFFECT OF A WAVEGUIDE MATERIAL TO DEFLECT A GUIDED LASER BEAM ENABLES FAST SCAN TIMES AND FRAME RATES. INCORPORATING THE INTEGRATED OPTIC SCANNER WITH DIODE PUMPED, FREQUENCY DOUBLED, Nd YAG LASERS WILL ENABLE DISPLAYS OF SMALL VOLUME. FINALLY, THE SOLID STATE CONSTRUCTION OF THE LASER SCANNER WILL PROVIDE A RUGGED AND RELIABLE DEVICE WITH LOW OPERATING POWER REQUIREMENT.

APTEK INC
1257 LAKE PLAZA DR
COLORADO SPRINGS, CO 80906
CONTRACT NUMBER: DACA39-87-C-0047
MARK D LANDON
TITLE:
GRAPHICAL ANIMATION OF DYNAMIC FINITE ELEMENT/DIFFERENCE
PROGRAM OUTPUT DATA ONTO VIDEO TAPE
TOPIC# 262 OFFICE: AWES/CORPS IDENT#: 16975

THIS PHASE II WORK WILL DEVELOP AND DELIVER A VIDEOTAPE ANIMATION SYSTEM THAT WILL BE USED BY WES EMPLOYEES TO MAKE COLOR COMPUTER GRAPHIC MOVIES OF DYNAMIC FINITE ELEMENT AND FINITE DIFFERENCE OUTPUT DATA. THE ANIMATION SYSTEM WILL CONSIST OF A COLOR COMPUTER GRAPHICS TERMINAL, A VIDEO IMAGE ENCODER, A VIDEOTAPE RECORDER CONTROLLER, VIDEOTAPE RECORDER, A TELEVISION MONITOR, A COMPUTER GRAPHIC SOFTWARE PACKAGE AND THE VIDEOTAPE RECORDER CONTROLLING SOFTWARE. OTHER TOPICS OF THIS PHASE II WORK ARE: 1) DEVELOPMENT OF A NEURAL FORMAT.

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FOR INTERFACING THE MANY DYNAMIC FE AND FD CODES AT WES TO THE ANIMATION SYSTEM, 2) DEVELOPMENT OF A HIGH-QUALITY TEXT FONT THAT WILL DISPLAY READABLE TEST ON A TV MONITOR, 3) DEVELOPMENT OF THE CAPABILITY TO UTILIZE COMPUTER GRAPHIC IMAGES FROM MANY COMPUTER GRAPHICS SOFTWARE PACKAGES, 4) THE INVESTIGATION OF THE TWO-WAY COMMUNICATION BETWEEN CONTROLLER AND HOST NECESSARY FOR FRAME GRABBING, AND 5) THE INVESTIGATION OF AUDIO RECORDING OF NARRATION, SOUND EFFECTS, ETC. ONTO THE VIDEOTAPE.

ASPEN SYSTEMS INC
184 CEDAR HILL ST
MARLBOROUGH, MA 01752
CONTRACT NUMBER: DAAK60-87-C-0035
JOE MacKOUL
TITLE:
EXHAUST HEAT DRIVEN THERMOELECTRIC FAN
TOPIC# 177 OFFICE: NATICK IDENT#: 17336

DURING COLD AMBIENT CONDITIONS, THE THERMAL GRADIENTS CREATED BY STANDARD NON-ELECTRIC MILITARY HEATERS IN ARMY TENTS AND BARRACKS PRODUCE UNCOMFORTABLE LIVING CONDITIONS WHICH CAN BE SIGNIFICANTLY IMPROVED BY USING A THERMOELECTRICALLY DRIVEN CIRCULATING FAN. DURING PHASE I, ASPEN SYSTEMS DESIGNED, MANUFACTURED, AND DELIVERED A PROTOTYPE TO THE ARMY THAT MET ALL THEIR TECHNICAL REQUIREMENTS, ACHIEVING AN 80 PERCENT IMPROVEMENT IN SYSTEM EFFICIENCY COMPARED TO PREVIOUSLY PUBLISHED DATA. THE PHASE II PRINCIPAL OBJECTIVES ARE: SURVEY RECENT ADVANCES IN THERMOELECTRIC TECHNOLOGY TO SELECT THE MOST APPROPRIATE THERMOELECTRIC MATERIAL; SELECT THE OPTIMUM MOUNTING APPROACH BY LABORATORY TESTING VARIOUS CONFIGURATIONS; DESIGN OPTIMUM HOT AND COLD SIDE HEAT EXCHANGERS; DESIGN SAFETY CONTROLS AND DEVICES TO PREVENT OVERHEATING; LABORATORY TEST ALL DESIGN IMPROVEMENTS; PRODUCE A PREPRODUCTION DESIGN THAT INCORPORATES THE SUM TOTAL OF THE ARMY'S REQUIREMENTS; BUILD FIVE PROTOTYPES; TEST ONE IN A TENT IN NATICK AND OBTAIN PERFORMANCE DATA; SEND ALL UNITS TO THE FIELD FOR TESTING UNDER ACTUAL FIELD CONDITIONS; AND, PRODUCE A FINAL REPORT AND A FINAL DESIGN PACKAGE THAT CAN BE USED IN THE PRODUCTION OF THE UNIT. BY THE END OF PHASE II THE ARMY CAN EXPECT TO BE ABLE TO ORDER THESE SYSTEMS AT A PROJECTED PRICE UNDER \$250 PER UNIT.

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ATAC
1200 VILLA ST
MOUNTAIN VIEW, CA 94041
CONTRACT NUMBER: DAAA21-87-C-0166
BRADLEY C ASHMORE
TITLE:
COMPUTER AIDED TESTABILITY FOR SOFTWARE (SOFT-CAT)
TOPIC# 19 OFFICE: ARDEC IDENT#: 17266

THIS PROPOSAL DESCRIBES A PRODUCT WHICH WILL SIGNIFICANTLY REDUCE THE COST OF TESTING AND REPAIRING SOFTWARE. THE COMPUTER AIDED TESTABILITY FOR SOFTWARE (SOFT-CAT) PRODUCT WILL ADVANCE THE STATE-OF-THE-ART BY PROVIDING: 1) A MUCH IMPROVED METHOD OF PREDICTING WHETHER SOFTWARE IS UNTESTABLE, 2) EXPLICIT GUIDANCE TO ASSIST IN TEST GENERATION, 3) A TEST HOOK DESIGN AND PLACEMENT METHODOLOGY WHICH SUPPORTS AN INTELLIGENT FAULT ISOLATOR (WHICH PERMITS RUN-TIME DATA TO BE USED TO SPEED IDENTIFICATION OF SOFTWARE FAULTS) AND 4) IDENTIFICATION OF CERTAIN PROGRAM LOGIC INCONSISTANCIES. THE BASIC OF THESE ANALYSES IS A NEW MODELING METHOD WHICH COMBINES PROGRAM FLOW WITH DATA FLOW INFORMATION. A FRIENDLY USER-INTERFACE WILL PERMIT EASY AND PAINLESS APPLICATION OF THESE POWERFUL ANALYSES.

ATLANTIC AEROSPACE ELECTRONICS CORP
470 TOTTEN POND RD
WALTHAM, MA 02154
CONTRACT NUMBER: DAAL02-87-C-0071
PAUL F MCKENZIE
TITLE:
DESIGN AND CONSTRUCTION OF A RECIRCULATING CONSTANT GEOMETRY PROCESSOR FOR MICOM'S DIGITAL BEAMFORMING TESTBED
TOPIC# 41 OFFICE: MICOM IDENT#: 17287

ATLANTIC AEROSPACE ELECTRONICS HAS INVESTIGATED THE UTILITY OF A DIGITAL BEAMFORMING PROCESSOR APPROACH BASED ON THE CONSTANT GEOMETRY FFT DESCRIBED BY SINGLETON. THIS STUDY WAS CARRIED OUT UNDER A

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PHASE I SBIR FOR HARRY DIAMOND LABORATORIES. THE RESULTS OF THIS DIGITAL BEAM FORMING STUDY ARE GIVEN IN REFERENCE 1. AN IMPORTANT FEATURE OF THE CONSTANT GEOMETRY APPROACH IS THAT IT IMPLEMENTS THE PROCESSING FOR DBF IN A DISTRIBUTED FASHION WHICH IS MATCHED TO THE WAY IN WHICH THE INPUT DATA IS ORGANIZED. THE CONSTANT GEOMETRY ALLOWS DATA TO BE RECIRCULATED THROUGH A SET OF $N/2$ PROCESSING MODULES TO PERFORM SUCCESSIVE STAGES OF THE FFT ALGORITHM. THIS AVOIDS THE NEED FOR LARGE NUMBERS OF HIGH BANDWIDTH INTERCONNECT BUSES AND FOR LARGE CONNECTOR AND CHIP PINOUTS. THE ARCHITECTURE IS WELL SUITED TO APPLICATIONS SUCH AS ARMY AIR DEFENSE RADAR WHERE THE SAMPLING RATE IN EACH CHANNEL NEEDED TO SUPPORT TYPICAL SURVEILLANCE WAVEFORM RANGE RESOLUTION REQUIREMENTS IS LESS THAN A FEW MEGA-HERTZ SO THAT INDIVIDUAL PROCESSING ELEMENTS CAN EXECUTE SEVERAL INSTRUCTION CYCLES PER INPUT SAMPLE. MICOM IS CURRENTLY IN THE PROCESS OF PROCURING A C-BAND ARRAY WITH 64 DIGITAL RECEIVERS FOR USE IN THEIR DIGITAL BEAMFORMING TESTBED. THIS SBIR PHASE II PROPOSAL IS FOR THE DESIGN AND CONSTRUCTION OF A RECIRCULATING, CONSTANT-GEOMETRY DIGITAL-BEAM-FORMING PROCESSOR WHICH CAN BE USED IN THIS TESTBED TO FURTHER THE DEVELOPMENT OF DIGITAL BEAMFORMING TECHNOLOGY. DEMONSTRATION OF THE APPROACH OF MICOM'S TESTBED IS AN IMPORTANT FIRST STEP IN THIS DIRECTION. WHILE THE PROPOSED PROCESSOR IS BASED ON THE USE OF DISCRETE DIGITAL PROCESSING COMPONENTS, IT IS AMENABLE TO REDUCTION TO HIGH DENSITY VHSIC OR ASIC (APPLICATION SPECIFIC INTEGRATED CIRCUIT) IMPLEMENTATIONS FOR INCORPORATION IN FUTURE ARMY RADAR DESIGNS.

AUTOMETRIC INC
5301 SHAWNEE RD
ALEXANDRIA, VA 22312
CONTRACT NUMBER: DACA76-87-C-0007
DEWEY HOUCK
TITLE:
MULTISENSOR RECORD REGISTRATION
TOPIC# 241 OFFICE: ETL/COE IDENT#: 16960

THIS PROPOSAL IS A PHASE II CONTINUATION OF THE PHASE I MULTISENSOR RECORD REGISTRATION CONTRACT NUMBER DACA76-87-C-0007. THE WORK IS DIVIDED INTO 5 TASKS. TASK 1 IS THE BASELINE TASK, AND THE REMAINING FOUR TASKS ARE OPTIONS. TASK 1 IS A CONTINUATION OF THE DEMONSTRA-

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TION SCENARIO DONE UNDER PHASE I OF THIS SBIR. IT IS PROPOSED TO MOVE THE PHASE I SOFTWARE TO THE VISION 120 SYSTEM AND TO ADD THE CAPABILITY TO UTILIZE DTED, TO RECTIFY THE IMAGERY, TO WINDOW A SUB-SCENE OF THE SLAVE IMAGE INTO THE MASTER IMAGE, AND TO PERMIT SMOOTH TRACKING BETWEEN CONTROL POINTS. TASK 2 PROPOSES TO DEVELOP AND INTEGRATE A NEW SENSOR INTO THE SYSTEM. TASK 3 PROPOSES TO DEVELOP EFFICIENT SEARCH ROUTINES AFTER THE METHOD OF EPIPOLAR LINES WHEN DTED IS UNAVAILABLE. TASK 4 PROPOSES TO INVESTIGATE SEVERAL ALTERNATIVE TECHNIQUES OF WIDE AREA SEARCH TO BE USED WHEN SENSOR PLATFORM PARAMETERS ARE INACCURATELY KNOWN. THE MOST PROMISING METHOD WILL BE RECOMMENDED FOR IMPLEMENTATION. TASK 5 PROPOSES TO IMPLEMENT AND TO INTEGRATE THE RECOMMENDATION OF TASK 4 INTO THE TASK 1 SOFTWARE.

BARR ASSOCS INC
2 LYBERTY WY
WESTFORD, MA 01886
CONTRACT NUMBER: DAAL04-87-C-0053
DR GHANIM AL-JUMAILY

TITLE:

ION ASSISTED DEPOSITION OF RUGATE FILTERS FOR EYE PROTECTION
DEVICES FROM LASER RADIATION

TOPIC# 112 OFFICE: MTL IDENT#: 17327

ION ASSISTED DEPOSITION (IAD) OF THIN FILMS WILL BE EMPLOYED TO DEPOSIT OXYNITRIDES OF SILICON AND ALUMINUM COATINGS. THE IAD PROCESS PRODUCES DISCRETE AND GRADED INDEX COATINGS WITH IMPROVED OPTICAL AND MECHANICAL PROPERTIES. THESE COATINGS WILL BE USED FOR MAKING EYE PROTECTION SYSTEMS FOR LASER RADIATION. OPTICAL FILTERS MADE WITH SINUSOIDAL INDEX PROFILE ARE USUALLY REFERRED TO AS RUGATE FILTERS. THESE FILTERS CAN BE MADE WITH VERY NARROW REJECTION BAND TO SELECTIVELY BLOCK ANY LASER LINE. THE LASER PROTECTION SYSTEM WILL BE MADE USING A WIDE BANDPASS FILTER THAT TRANSMITS THE VISIBLE RADIATION AND A RUGATE FILTER TO BLOCK THE DOUBLED YAG. OTHER APPLICATIONS OF DURABLE COATINGS SUCH AS WIDEBAND ANTIREFLECTION COATINGS AND NARROW BAND REFLECTION POSSIBLY FOR HEADS-UP DISPLAY SYSTEMS WILL BE EXAMINED. SEVERAL DIAGNOSTIC TECHNIQUES WILL BE EMPLOYED TO EXAMINE THE OPTICAL PROPERTIES, ENVIRONMENTAL DURABILITY, LASER DAMAGE THRESHOLD, COMPOSITION, AND MECHANICAL PROPERTIES OF SINGLE AND MULTILAYER COATINGS.

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BATTERY ENGINEERING INC
1636 HYDE PARK AVE
HYDE PARK, MA 02189
CONTRACT NUMBER: DAAL01-87-C-0751
DR CARL SCHLAIKJER
TITLE:
IMPROVEMENT IN THE CAPACITY AND SAFETY OF LITHIUM/INORGANIC
ELECTROLYTE SULFUR DIOXIDE RECHARGEABLE CELLS
TOPIC# 143 OFFICE: ETDL IDENT#: 15182

DURING PHASE I, WE BUILT LITHIUM/SO2 RECHARGEABLE CELLS IN WHICH LITHIUM SALTS WERE MADE MORE SOLUBLE WITHOUT ORGANIC COSOLVENTS BY USING ADDITIONAL HIGHLY SOLUBLE NON-LITHIUM SALTS. SINCE CELLS RAN BELOW 3 VOLTS, THE DISCHARGE PRODUCT WAS LIKELY DITHIONITE, AS IT IS IN ORGANIC ELECTROLYTE PRIMARY CELLS. PHASE II OBJECTIVE: TO DEVELOP THIS SYSTEM BY IDENTIFYING THE BEST ELECTROLYTE, POSITIVE ELECTRODE, AND SEPARATOR COMPOSITIONS FOR THE BEST PERFORMANCE AND RESISTANCE TO OVERCHARGE. DESCRIPTION OF EFFORT: SIX TASKS STARTING WITH THE CYCLING OF WOUND AA PROTOTYPES, LEADING TO THE TESTING OF D SIZE CELLS, EVALUATING PERFORMANCE, SAFETY, AND SHELF LIFE. ANTICIPATED RESULTS: IF THE PROJECT IS SUCCESSFUL, WE WILL HAVE ESTABLISHED HOW TO CONSTRUCT CELLS WHICH MAINTAIN THE STATE OF THE ART ADVANTAGES OF Li/LiAlCl4*xSO2/C RECHARGEABLES, BUT WITH CAPACITIES COMMENSURATE WITH THE AMOUNT OF ACTIVE MATERIALS PRESENT.

BLOOM E J ASSOCS INC
115 DURAN DR
SAN RAFAEL, CA 94903
CONTRACT NUMBER: DAAL02-87-C-0062
GORDON E BLOOM
TITLE:
PROTOTYPE DEVELOPMENT OF A LOW-COST MINIATURE DC-DC
CONVERTER SYSTEMS AND CONTROL
TOPIC# 61 OFFICE: HDL/LABCOM IDENT#: 17306

THIS PROPOSAL PROVIDES FOR THE PROTOTYPE DESIGN AND DEVELOPMENT OF

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A UNIQUE DC-TO-DC POWER CONVERTER SYSTEM AND CONTROL NETWORKS, BASED ON THE DESIGN APPROACHES SUCCESSFULLY DEVELOPED IN PHASE I OF SBIR TOPIC A87-61. THIS SYSTEM IS CAPABLE OF CHARGING A 0.068 MICROFARAD CAPACITOR TO 3000 VDC WITHIN 0.5 SECOND AFTER SYSTEM ACTIVATION BY APPLICATION OF A 20 TO 40VDC INPUT POTENTIAL. CONTROLS TO BE DEVELOPED INCLUDING FIRING AND LOGIC NETWORKS.

BRIMROSE CORP OF AMERICA
7720 BELAIR RD
BALTIMORE, MD 21236
CONTRACT NUMBER: DAAB67-87-C-F060
DR S B TRIVEDI
TITLE:
GROWTH AND CHARACTERIZATION OF $Cd(1-x)Zn(x)Te$ SINGLE CRYSTALS
TOPIC# 310 OFFICE: CECOM/NV IDENT#: 17432

BRIMROSE CORPORATION WILL DEVELOP A $Cd(1-x)Zn(x)Te$ GROWTH SYSTEM WITH THE CAPABILITY OF 'IN SITU' VISUALIZATION OF GROWING INTERFACE. THIS WILL HELP GROW SUBSTRATE QUALITY $Cd(1-x)Zn(x)Te$ CRYSTALS OF LARGE SIZE FOR ADVANCED INFRARED APPLICATION. THE MAJOR PARTS OF THIS SYSTEM ARE: (a) BRIDGMAN FURNANCE FOR THE GROWTH OF $Cd(1-x)Zn(x)Te$ CRYSTALS AND (b) INFRARED IMAGING SYSTEM. THE WORK IS AIMED AT ACCOMPLISHING AN INTELLIGENT COUPLING BETWEEN GROWTH FURNACE AND INFRARED IMAGING IN A MANNER TO: (a) DEVELOP AN INTEGRATED UNIT OPERATION WHICH IS SIMPLE AND (b) TO COMBINE THE TWO SYSTEMS WHICH DOES NOT INTERFERE WITH FUNCTIONS OF EACH OTHER.

CARLOW ASSOCS INC
8315 LEES HWY - STE 410
FAIRFAX, VA 22031
CONTRACT NUMBER: DAAA15-87-C-0058
DR MARK KIRKPATRICK
TITLE:
HUMAN FACTORS ENGINEERING IMPLICATIONS OF SUPERVISORY CONTROL FOR MANIPULATIVE ROBOTIC SYSTEMS
TOPIC# 101 OFFICE: HEL IDENT#: 16092

THIS PROPOSED EFFORT IS DIRECTED AT EMPIRICAL TESTING OF HUMAN

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ENGINEERING ASPECTS OF THE DESIGN OF SUPERVISORY CONTROL SYSTEMS FOR ARMY TELEROBOTIC SYSTEMS. A NUMBER OF ISSUES INVOLVED IN CONTROL SCHEMES AND OPERATOR-COMPUTER INTERFACES WERE INVESTIGATED DURING PHASE I AND OBJECTIVES WERE PUT FORTH FOR CANDIDATE SIMULATION AND PROTOTYPE TESTS. IN THE PROPOSED EFFORT, EMPIRIAL TESTING WILL BE CARRIED OUT OF VARIOUS LEVELS OF CONTROL AND SPECIFIC CONTROL SYSTEMS FOR GENERIC TASKS/FUNCTIONS INCLUDING: 1) REMOTE VEHICLE DRIVING, 2) REMOTE MANIPULATION, 3) REMOTE PERCEPTION AND 4) OPERATOR-COMPUTER INTERFACE DESIGN. FOUR CONTRACT OPTIONS ARE PROPOSED. THESE ADDRESS THE FOUR TECHNICAL AREAS LISTED ABOVE. TESTING WILL BE CONDUCTED AT ABERDEEN PROVING GROUND, MD USING PROTOTYPE EQUIPMENT PROVIDED BY THE USAHEL ROBOTICS LABORATORY. TEST DATA WILL BE ANALYZED TO QUANTIFY EFFECTS ON OPERATOR/SYSTEM PERFORMANCE OF DESIGN PARAMETERS. RESULTS OF TESTS PROVIDE EMPIRICALLY BASED DESIGN PRINCIPLES FOR FUTURE DESIGN OF CONTROL SYSTEMS FOR ARMY TELEROBOTICS APPLICATIONS AS WELL AS FOR APPLICATIONS IN OTHER CONTEXTS.

CARNEGIE GROUP INC
5 PPG PLACE
PITTSBURGH, PA 15222
CONTRACT NUMBER: DAA15-87-C-0055
DR MARK FOX
TITLE:
CONSTRAINT DIRECTED PLANNER FOR LOGISTICS AMMUNITION MANAGEMENT
TOPIC# 100 OFFICE: HEL IDENT#: 16065

THE CURRENT PROPOSAL IS AN EXTENSION OF THE WORK PERFORMED IN SBIR PHASE I (ARMY CONTRACT: DAA15-87-C-0055). DURING PHASE I, CGI DEVELOPED A SMALL PROTOTYPE OF THE AMMUNITION MANAGEMENT PROBLEM OF INTEREST TO THE U.S. ARMY, USING KNOWLEDGE CRAFT AND SIMULATION UTILITIES BEING DEVELOPED AT CGI. THE PROTOTYPE WAS DEVELOPED ON COLOR SYMBOLICS. DURING PHASE II (CURRENT PROPOSAL), OUR FOCUS IS TO HELP HE EXTEND THE PHASE I PROTOTYPE MODEL TO INCLUDE A DETAILED AMMUNITION DISTRIBUTION MODEL FOR USE. CGI WILL DESIGN AND IMPLEMENT PLANNING ALGORITHMS, WHICH CAN BE USED COLLECTIVELY TO SOLVE A VARIETY OF THE ARMY'S PROBLEMS OF AMMUNITION MANAGEMENT AND DISTRIBUTION DURING WAR TIME. THESE PLANNING ALGORITHMS WILL FORM THE BASIS OF THE ARCHITECTURE FOR AN INTERACTIVE PLANNING DECISION SUP-

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PORT SYSTEM (DSS) FOR AMMUNITION LOGISTICS. OUR APPROACH IS TO CONSTRUCT AN INTERACTIVE PLANNER USING A BLACKBOARD ARCHITECTURE (ERMAN, ET.AL, 1980; Ni, 1986), WITH FOCUS ON TWO MAJOR ISSUES: CONSTRAINT DIRECTED SEARCH FOR EXPLORING ALTERNATIVE PLAN GENERATION AND EVALUATION, AND ITS LINKAGE TO: KNOWLEDGE BASED SIMULATION TECHNIQUES FOR ANSWERING COMPLEX "WHAT IF" QUESTIONS OR EFFECTS OF CHANGE FOR LONG RANGE PLANNING. THE PHASE II WORK FOCUSES MORE ON THE PLANNING ISSUES THAN MODELING AND SIMULATION ASPECTS COVERED IN PHASE I. THE WORK OF SATHI ET.A. (1985) WILL FORM THE BASIS OF THE MODELING EFFORT, WHILE PLANNING AND CONSTRAINT DIRECTED REASONING TECHNIQUES WILL EXTEND THE ISIS/OPIS WORK OF (FOX, ET.AL., 1983, 1985). FOR THE CLASS OF COMPLEX PROBLEMS FOR WHICH SIMULATION IS THE MOST APPROPRIATE TECHNOLOGY, KB SIMULATION WORK OF (REDDY, 1986) AND (SATHI, 1986) CAN BE USED MOST EFFECTIVELY. THE PROPOSAL ALSO DESCRIBES A SYSTEMATIC WORKPLAN FOR DESIGNING AND IMPLEMENTING PLANNING ALGORITHMS FOR AN INTERACTIVE DSS.

CGS SYSTEMS INC
65 CASTLE HOWARD CT
PRINCETON, NJ 08540
CONTRACT NUMBER: DAAL02-87-C-0061
ALBERT H MEDWIN
TITLE:
CONTINUATION OF DEVELOPMENT OF A NON-CONTACT (CAPACITIVE)
FUZE SETTER
TOPIC# 64 OFFICE: HDL/LABCOM IDENT#: 17312

PHASE II WILL COVER IMPROVEMENTS IN BOTH THE ELECTRONIC AND MECHANICAL SENSOR DESIGNS. DEVICE LEVEL COMPUTER SIMULATIONS WILL BE USED FOR IN-DEPTH STUDIES OF THE CRITICAL CAPACITANCE SENSING CIRCUITRY, WITH PARTICULAR ATTENTION GIVEN TO CRITICAL TIMING RESTRAINTS AND THE ADDITION OF SELF-TEST AND PIN-CAPACITANCE BALANCING FUNCTIONS. THE PHASE I LOGIC DESIGN WILL BE REVIEWED AND INTERFACE CIRCUITRY ADDED FOR CONNECTION TO THE OTHER ELECTRONIC PORTIONS OF THE FUZE ASSEMBLY. LOGIC LEVEL SIMULATIONS WILL VERIFY THE FUNCTIONS, AS WELL AS TEST FOR RACE CONDITIONS, SPIKES, OR OTHER HAZARDS. THE ARTWORK FOR FORMING THE CAPACITORS AND THEIR INTERCONNECTIONS WILL BE DEVELOPED IN A RIGHT CIRCULAR CONE, TO CONFORM TO THE SHAPE OF THE FUZE ASSEMBLY. AIDS FOR ASSEMBLING THE FLEXIBLE STRIPS AND

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DEVICES FOR MAINTAINING LIGHT CONTACT WILL BE DEVELOPED AND TESTED.

CHENG TECHNOLOGY & SERVICES INC
101 FIRST ST - STE 413
LOS ALTOS, CA 94022
CONTRACT NUMBER: DAAE07-87-C-8052
DR DAH YU CHENG
TITLE:
WATER CANTEEN TEMPERATURE MAINTAINING SYSTEM FOR COMBAT
VEHICLE CREWS
TOPIC# 156 OFFICE: TACOM IDENT#: 17373

A FEASIBILITY STUDY (PHASE I) WAS SUCCESSFULLY COMPLETED WITH EXPERIMENTAL VERIFICATION OF THE PERFORMANCE OF A NEW COMPOUND COOLED DRINKING WATER SYSTEM FOR USE BY CREWS INSIDE A COMBAT VEHICLE IN THE ALL BUTTONED UP CONDITION. THE SYSTEM WAS TESTED IN AN ENVIRONMENTAL CHAMBER SET AT 150 DEG F WITH A WET BULB TEMPERATURE RANGING BETWEEN 100 TO 120 DEG F. WATER CAN BE COOLED DOWN TO 70 DEG F WITH A FILLING TEMPERATURE OF 100 DEG F. AT THIS TEMPERATURE THE CREW WOULD BE ENCOURAGED TO DRINK A SUFFICIENT QUANTITY TO MAINTAIN THEIR BODY ELECTROLYTE BALANCE. DURING THIS PROPOSED PHASE II EFFORT, A PRE-PRODUCTION COOLED DRINKING WATER SUPPLY SYSTEM WILL BE DEVELOPED FOR THE BRADLEY (M-2) TYPE COMBAT VEHICLE. THE SYSTEM WILL HAVE APPROXIMATELY A 5 GALLON WATER STORAGE CAPACITY AND A HARDENED STRUCTURAL DESIGN FOR VEHICLE COMBAT OPERATIONS. THE GOAL WILL BE TO COOL THE WATER IN REASONABLE TIME WITH A COMPACT COOLING SYSTEM HAVING NO MOVING PARTS EXCEPT FOR A SMALL FAN. THE SYSTEM WILL BE OF RUGGED CONSTRUCTION AND WILL BE USED VERY LITTLE POWER. THE DELIVERABLES WILL BE 3 WORKING PROTOTYPE UNITS FOR THE ARMY TANK COMMAND'S BETA SITE TESTING BEFORE COMMITTING TO PHASE III PRODUCTION AND MANUFACTURING.

CHI SYSTEMS INC
1166 DeKALB PIKE
BLUE BELL, PA 1942.
CONTRACT NUMBER: DAAE07-C-0755
FLOYD A GLENN III
TITLE:
DEVELOPMENT OF A HUMAN OPERATOR MODEL MANAGEMENT ENVIRONMENT
(HOMME)
TOPIC# 288 OFFICE: ARI IDENT#: 15038

SUBMITTED BY

PROBLEMS WITH EXISTING SIMULATION AND MODELING TOOLS ARE REVIEWED RELATIVE TO DEVELOPMENT AND EVALUATION OF MAN-MACHINE SYSTEMS. A NEW, USER-FRIENDLY SIMULATION TOOL IS PROPOSED TO SUPPORT THE CONSTRUCTION OF SIMULATIONS OF THE PERFORMANCE OF MAN-MACHINE SYSTEMS BY OFFERING HIGH-LEVEL REPRESENTATIONAL AIDS AND MODELS FOR HUMAN PERFORMANCE ALONG WITH A USER INTERFACE THAT IS EASILY LEARNED AND USED. DESIGNATED THE HUMAN OPERATOR MODEL MANAGEMENT ENVIRONMENT (HOMME), THIS TOOL ENABLES THE USER TO CONSTRUCT ALL SPECIFICATIONS FOR A SIMULATION VIA A GUIDED TASK ANALYSIS TYPE OF PROCESS. HOMME AIDS THE USER IN CONSTRUCTING TASK PROCEDURES AND IN DEFINING THE CONTROL INTERRELATIONS BETWEEN PROCEDURES, AS WELL AS IN STORING, RETRIEVING, AND EDITING PROCEDURES GENERATED IN EARLIER SIMULATION EFFORTS. IT IS INTENDED TO SERVE AS AN ADJUNCT TOOL TO THE MORE GENERAL SIMULATION SHELL KNOWN AS HOS-IV.

CIM SYSTEMS

274 W CAMPBELL RD - STE 411

RICHARDSON, TX 75080

CONTRACT NUMBER: DAAE07-87-C-8059

DR POM PIUMSOMBOOM

TITLE:

INTELLIGENT KNOWLEDGE-BASED CAD FOR PRODUCIBILITY

TOPIC# 163 OFFICE: TACOM IDENT#: 17379

THIS DOCUMENT IS THE PHASE II PROPOSAL OF CIM SYSTEM'S PHASE I SBIR CONTRACT WITH TACOM (TANK AUTOMOTIVE COMMAND) FOR RESEARCHING AND DEFINING REQUIREMENTS FOR DEVELOPING KNOWLEDGE-BASED DECISION SUPPORT SYSTEM THAT WILL ENHANCE THE "DESIGN FOR PRODUCIBILITY" PROCESS. THE AIM OF THIS RESEARCH INITIATIVE IS THE ESTABLISHMENT OF A FOUNDATION FOR DEVELOPMENT OF A DECISION SUPPORT SYSTEM, UTILIZING AI/KNOWLEDGE-BASED TECHNOLOGIES, THAT WILL ENABLE DESIGNERS TO OPTIMIZE A PART DESIGN FROM A MANUFACTURABILITY PERSPECTIVE DURING OR FOLLOWING THE DESIGN OF A PART. PHASE I WORK EFFORT WAS DIRECTED TO REVIEW AND RESEARCH ENABLING TECHNOLOGIES, TECHNICAL LITERATURE, AND HUMAN REASONING PROCESSES THAT WILL BE REQUIRED. THE EMPHASIS OF THE PHASE I EFFORT WAS ON PRODUCIBILITY REQUIREMENTS FOR PARTS DESIGNS WHICH ARE METALS MACHINING INTENSIVE. PHASE II EFFORT WILL ENTAIL THE DESIGN AND DEVELOPMENT OF A "PROOF OF CONCEPT" PROTOTYPE. CIM SYSTEMS, INC.

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PROPOSES TO COMBINE ITS EXTENSIVE EXPERIENCE IN THE MANUFACTURING DOMAIN WITH THE AI/ES EXPERTISE OF COMPUTER THOUGHT CORP, AND THE AUTOMATION AND ROBOTICS RESEARCH INSTITUTE AT THE UNIV. OF TEXAS AT ARLINGTON. THE COMBINED CAPABILITY OF THESE ORGANIZATIONS WILL ENSURE THE SUCCESSFUL COMPLETION OF THIS PROPOSED INITIATIVE.

COLEMAN RESEARCH CORP

5950 LAKEHURST DR

ORLANDO, FL 32819

CONTRACT NUMBER: DACA39-87-C-0038

DR WILLIAM STEINWAY

TITLE:

ADVANCED SENSORS FOR CLOSE PROXIMITY ROBOTIC MINE DETECTION SYSTEM

TOPIC# 267

OFFICE: WES

IDENT#: 17000

A MULTIPLE SENSOR MINE DETECTION SYSTEM HAS BEEN DESIGNED WHICH CAN SIGNIFICANTLY IMPROVE THE U.S. ARMY'S CAPABILITY TO DETECT AND ULTIMATELY REMOVE MINES. IMPROVED PERFORMANCE IS PROVIDED BY A UNIQUELY DESIGNED FREQUENCY STEPPED GROUND PENETRATION RADAR AND USE OF A DUAL BAND INFRARED SENSOR. THE INFORMATION GATHERED BY THESE SENSORS, IN CONJUNCTION WITH A VISIBLE SENSOR, IS FUSED TOGETHER TO MAKE A MINE/NON-MINE DECISION USING AI/EXPERT SYSTEM PROCESSING. THE OBJECTIVE OF THIS PHASE II EFFORT IS TO FABRICATE, ASSEMBLE, TEST AND EVALUATE THREE SENSORS WHICH ARE INTEGRATED TO FORM A MINE DETECTION SYSTEM. THE SENSORS INCLUDE A FREQUENCY STEPPED GROUND PENETRATION RADAR, A DUAL BAND INFRARED SCANNER, AND A VIDEO SCANNER. THE INTEGRATION OF THE SENSOR OUTPUT INFORMATION AND ULTIMATE DECISION FOR MINE/NON-MINE OBJECT IS PERFORMED BY AN AI MICROPROCESSOR WITH A SOFTWARE 'EXPERT SYSTEM' IMPLEMENTED. WITH AN IMPROVED GROUND PENETRATION RADAR AND INFRARED SENSOR, COUPLED WITH THE 'EXPERT SYSTEM' PROCESSING, THE MINE DETECTION SYSTEM WILL BE ABLE TO PROVIDE IMPROVED PERFORMANCE OVER CURRENTLY AVAILABLE SYSTEMS.

CONSULTANT'S CHOICE INC

8800 ROSEWELL RD

ATLANTA, GA 30338

CONTRACT NUMBER: DAAD07-87-C-107

ROGER W ANDERSON

TITLE:

AUTOMATED WEATHER FACTOR ANALYSIS AND DISPLAY

TOPIC# 71

OFFICE: LABCOM/ASL

IDENT#: 16015

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THE WIDE DISPERSION OF U.S. ARMY FORCES ON THE MODERN BATTLEFIELD AND THE COMPLEXITY OF CURRENT WEAPON SYSTEMS HAVE INCREASED THE REQUIREMENTS FOR AUTOMATED WEATHER EFFECTS ANALYSIS. IN ORDER FOR A WEATHER ANALYST TO EVALUATE THE EFFECTS OF WEATHER ON MILITARY OPERATIONS, WEATHER EVENTS MUST BE REGISTERED AND SCALED TO A MAP BACKGROUND. THEREFORE, THE OVERALL GOAL OF THIS R&D PROPOSAL IS TO INTEGRATE AND TO EVOLVE THE EXISTING SET OF TWI MODELS INTO A MORE SOPHISTICATED SET OF PROGRAMS CAPABLE OF AUTOMATING WEATHER EFFECTS ANALYSIS AND DISPLAY. IN ADDITION, THIS PROPOSAL INCLUDES WORK TO DESIGN, TEST, EVALUATE, AND DETERMINE THE POTENTIAL OF ARTIFICIAL NEURAL SYSTEMS TO SUPPORT AUTOMATED METEOROLOGICAL FORECASTING WITHIN THE AUTOMATED WEATHER EFFECTS ANALYSIS SYSTEM.

CONTINUUM DYNAMICS INC
PO BOX 3073
PRINCETON, NJ 08543
CONTRACT NUMBER: DAAL03-87-C-0013
DR TODD R QUACKENBUSH

TITLE:
ANALYSIS OF ROTOCRAFT INTERACTIONAL AERODYNAMICS USING MODERN
VORTEX DYNAMICS METHODS
TOPIC# 115 OFFICE: ARO/LABCOM IDENT#: 15071

CURRENT ANALYTICAL TOOLS ARE NOT ADEQUATE FOR THE ACCURATE PREDICTION OF THE WAKE-INDUCED LOADS EXPERIENCED BY HELICOPTER FUSELAGE COMPONENTS. RECENTLY, NEW METHODS HAVE BEEN DEVELOPED FOR THE ANALYSIS OF THE MAIN ROTOR WAKE AND SUCH FIXED SURFACES HAVE BEEN DEVELOPED AT CONTINUUM DYNAMICS, INC. AND DUKE UNIVERSITY. BY EMPLOYING A FULL-SPAN WAKE MODEL UNIQUE TO THIS ANALYSIS, GOOD CORRELATION OF PREDICTION OF WAKE-INDUCED VELOCITIES WITH MEASURED DATA HAS BEEN ACHIEVED. ALSO, NOVEL METHODS HAVE BEEN DEVELOPED FOR THE PREDICTION OF THE BEHAVIOR OF VORTICES DURING CLOSED INTERACTIONS WITH SURFACES, METHODS WHICH CAN ACCURATELY DEFINE THE VORTEX-INDUCED LOADS. THE PROPOSED PHASE II EFFORT WILL BUILD ON THE SUCCESS OF THIS WORK BY DEVELOPING A SELF-CONTAINED PACKAGE FOR THE PREDICTION OF WAKE-INDUCED LOADS. THE PHASE II EFFORT WILL ENTAIL NOT ONLY THE COUPLING OF THESE ADVANCED WAKE AND VORTEX-SURFACE TREATMENTS, BUT ALSO SIGNIFICANT NEW DEPARTURES IN RESEARCH ON THESE TOPICS. PROMINENT AMONG THESE WILL

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BE THE ENHANCEMENT OF THE PHASE I CLOSE-ENCOUNTER METHODS TO ACCURATELY TREAT VISCOUS EFFECTS, THE INCORPORATION OF THE WAKE OF NONLIFTING COMPONENTS SUCH AS THE ROTOR HUB AND THE EFFICIENT INCLUSION OF GROUND EFFECT.

CREATIVE OPTICS INC
32 WILDWOOD DR
BEDFORD, MA 01730
CONTRACT NUMBER: DAAK60-87-C-0036
JAMES C KILIAN
TITLE:
NOVEL TECHNIQUE FOR TARGET ACQUISITION REDUCTION EVALUATION
OF CAMOUFLAGE FOR PERSONNEL
TOPIC# 178 OFFICE: NATICK IDENT#: 17338

WE HAVE ACHIEVED IMPORTANT ADVANCES IN PHASE I IN TWO MAJOR AREAS:
(a) DEMONSTRATION OF A NEW METHODOLOGY FOR EVALUATING THE EFFECTIVENESS OF PERSONNEL CAMOUFLAGE FOR TARGET ACQUISITION REDUCTION (TAR), AND (b) DEMONSTRATION OF THE FEASIBILITY OF A NEW TECHNOLOGY FOR USE BY NATICK RD&E CENTER TO CONVENIENTLY AND RAPIDLY DESIGN, CONDUCT, AND ANALYZE CAMOUFLAGE EVALUATION FIELD TRIALS. WE ARE PROPOSING IN PHASE II TO GREATLY EXPAND THE ANALYSIS DEMONSTRATED IN PHASE I TO OBTAIN RELATIVE, OBJECTIVE MEASURES OF EVALUATION FOR THE TARGET ACQUISITION REDUCTION PROVIDED BY CAMOUFLAGE.

DECISION-SCIENCE APPLICATIONS INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER: DAAJ02-87-C-0017
ROBERT M KERCHNER
TITLE:
AIR-TO-AIR COMBAT ENGAGEMENT ANALYSIS UTILIZING TERRAIN
SHIELDING
TOPIC# 36 OFFICE: AVSCOM IDENT#: 17283

A PROGRAM TO DEVELOP A SIMULATION OF ONE-VERSUS-ONE HELICOPTER AIR-TO-AIR COMBAT IS PROPOSED. IT WILL PROVIDE A POWERFUL ANALYTIC

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TOOL FOR EXPLORING THE EFFECTIVENESS OF HELICOPTER DESIGNS, WEAPONS, AND SENSORS AS WELL AS TACTICS AND ENVIRONMENTS. THE EFFORT BUILDS UPON THE EXISTING TAC BRAWLER COMPUTER SIMULATION OF AIR-TO-AIR COMBAT INVOLVING FIXED WING AIRCRAFT. IT EMPLOYS EXPLICIT REPRESENTATION OF PILOT DECISION PROCESSES SUCH THAT SURPRISE, CONFUSION, AND THE UTILITY OF SENSOR INFORMATION ARE MODELED. THE SIMULATION WILL PROVIDE REALISTIC MODELING OF TERRAIN, ENEMY THREATS, COUNTERMEASURES AND TACTICS. THE PILOT DECISION LOGIC WILL EXPLICITLY CONSIDER THE EFFECTS OF TERRAIN SHEILDING.

DEFENSE RESEARCH TECHNOLOGIES INC
354 HUNGERFORD DR
ROCKVILLE, MD 20850
CONTRACT NUMBER: DAAL02-87-C-0044
DR TADEUSZ DRZEWIECKI
TITLE:

DEVELOPMENT OF INTEGRATED ACOUSTO-FLUIDIC COMPONENTS
TOPIC# 51 OFFICE: HDL/LABCOM IDENT#: 17299

THE PARAMETER THAT GOVERNS OPTIMAL ACOUSTO-FLUIDIC CIRCUIT OPERATION IS THE LENGTH OF THE INTERCONNECTING CHANNELS. THIS EFFORT WILL CENTER ON AN IMPLEMENTATION OF SSLPAS THAT MINIMIZES INTERCONNECTIONS TO VIRTUALLY "ZERO" LENGTH. VERTICAL LAMINATIONS WILL BE USED SO THAT THE OUTPUTS OF ONE SSLPA WILL DIRECTLY FEED INTO THE INTERACTION REGION OF THE NEXT. IN THE VERTICAL SCHEME, THE PLAN FORM OF INDIVIDUAL ELEMENTS WILL BE FORMED BY THE OPENINGS IN VERTICAL LAMINATES ARRANGED TO GENERATE A DESIRED SSLPA OUTLINE WITH STEPPED CONTOURS. PHASE I SHOWED THAT IN THE CONVENTIONAL HORIZONTAL LAYOUT OF LPAS, ONCE THE OUTPUTS WERE SHORTENED, LITTLE OR NO APPRECIABLE PERFORMANCE ADVANTAGE WAS OBTAINED BY USING THE SSLPA, OTHER THAN AN INCREASE IN INPUT IMPEDANCE. THIS INCREASED INPUT IMPEDANCE COULD NOT BE APPLIED TO DIFFERENTIAL AMPLIFIERS WITHOUT SIGNIFICANT LOSS IN DYNAMIC RANGE. HOWEVER, WHEN THE VERTICALLY STACKED INTEGRATED CIRCUIT (VESIC) FORMAT IS USED, SSLPAS CAN BE STAGED. THUS WITH THE HIGH INPUT IMPEDANCE MOST OF THE GAIN IS RECOVERABLE BETWEEN STAGES, AND, WHILE SSLPA MAY BE LITTLE OR NO STAGING LOSSES, RESULTING IN SELF-STAGED GAINS SIMILAR TO THOSE OF DIFFERENTIAL SYSTEMS. PACKAGING DENSITIES MAY BE INCREASED BY A FACTOR OF TEN BY ELIMINATING UNUSED SPACE.

DELFIN SYSTEMS
1349 MOFFETT PARK DR
SUNNYVALE, CA 94089
CONTRACT NUMBER: DAAA15-87-C-0054
MARK WILLIAMS
TITLE:

LOTS DECISION AID
TOPIC# 100 OFFICE: HEL/LABCOM IDENT#: 16072

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THE PHASE I LOGISTICS-OVER-THE-SHORE (LOTS) EFFORT DETERMINED THE TECHNICAL MERIT AND FEASIBILITY OF PROVIDING THE OCEAN TERMINAL COMMANDER IN THE THEATER OF OPERATIONS AN EXPERT SYSTEM-BASED DECISION MAKING AID FOR THE UTILIZATION OF WATERCRAFT LIGHTERAGE IN LOTS OPERATIONS. LOTS PHASE II IS PLANNED TO BE THE PRINCIPAL RESEARCH AND DEVELOPMENT EFFORT THAT WILL PRODUCE A WELL DEFINED ARTIFICIAL INTELLIGENCE DECISION AID CAPABLE OF SELECTING AND ALLOCATING AVAILABLE ASSETS, AND RAPIDLY EVALUATING ALTERNATIVE PLANS.

E.W.S. LTD INC
JOURNEY'S END RD
CROTON, NY 10520
CONTRACT NUMBER: DACA39-87-C-0032
ROBERT J RICHTER
TITLE:
NEW METHODS OF CONSTRUCTING SCALE MODEL ARMOR UNITS
TOPIC# 265 OFFICE: WES IDENT#: 16997

IN PHASE I A MANUFACTURING PROCESS WAS DEVELOPED AND SUCCESSFULLY DEMONSTRATED FOR LIMITED VARIETY OF MODEL DOLOSSE ARMOR UNITS. IN PHASE II THAT PROCESS WILL BE FURTHER DEVELOPED AND TESTED ON A WIDER VARIETY OF SHAPE/SIZE/DENSITY RELATIONSHIPS. THIS CAPABILITY WILL MEET A CRITICAL NEED IN THE COASTAL MODEL INVESTIGATION OF BREAKWATER STABILITY WORK UNIT IN THE COASTAL ENGINEERING R&D PROGRAM OF THE CORPS OF ENGINEERS. PREVIOUS UNITS HAVE SUFFERED FROM A LOW-BREAK STRENGTH. THE AIM OF THIS RESEARCH IS TO DEVELOP UNITS IN EITHER PLASTIC OR SUPER CONCRETE IN A COST-EFFECTIVE, SAFE MANNER, WHAT MEET THE EXACTING SPECIFICATIONS OF SCALE-MODEL TESTS.

EARTH TECHNOLOGY CORP (WESTERN)
100 W BROADWAY - STE 5000
LONG BEACH, CA 90802
CONTRACT NUMBER: DACA39-87-C-0035
ARUL K ARULMOLI
TITLE:
LARGE-SCALE LABORATORY STRESS CHAMBER SYSTEM FOR RESEARCH
IN GEOTECHNICAL ENGINEERING
TOPIC# 264 OFFICE: WES IDENT#: 16991

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THE OBJECTIVE OF THE PROPOSED PROJECT IS THE DESIGN, FABRICATION AND CHECKOUT OF A LARGE-SCALE STRESS CHAMBER SYSTEM FOR LABORATORY SIMULATION OF IN SITU SOIL STRESS CONDITION. A PRIMARY PURPOSE OF THE STRESS CHAMBER SYSTEM IS TO PROVIDE A COST-EFFECTIVE MEANS OF ADDRESSING COMPARING, AND DEVELOPING INTERPRETATIVE GUIDELINES FOR AND VALIDATING IN SITU DEVICES AND STUDYING IN SITU TESTING AND SAMPLING TECHNIQUES. SOME OTHER POTENTIAL APPLICATIONS INCLUDE L-G MODEL TESTS, MODEL PLUME TRACKING STUDIES, STUDY OF CEMENTING AND AGING EFFECTS ON SOILS, STUDY OF THE BEHAVIOR OF EARTH-ROCK MIXTURES, AND STUDY OF THERMAL BEHAVIOR OF SOILS. THE PHASE II PROPOSAL EFFECT WILL INCLUDE THE DESIGN OF VARIOUS COMPONENTS OF THE STRESS CHAMBER SYSTEM, PREPARATION OF DESIGN DRAWINGS, PURCHASE OF INSTRUMENTS/EQUIPMENT, FABRICATION OF THE STRESS CHAMBER SYSTEM, TRANSPORTATION OF THE SYSTEM OF WES, ASSEMBLY OF THE SYSTEM AT WES, AND CHECKOUT OF THE SYSTEM INCLUDING A TRIAL RUN WITH ONE SOIL TYPE.

EDWARDS COMMUNICATION ELECTRO-OPTICS

335 PARK ST NE

VIENNA, VA 22180

CONTRACT NUMBER: DAEA18-87-C-0035

RAJ B EDWARDS

TITLE:

LIGHTNING THREAT SENSING AND DISCONNECT SYSTEM

TOPIC# 236 OFFICE: TECOM IDENT#: 17366

EDWARDS COMMUNICATIONS ELECTRO-OPTICS (ECE) HAS DEFINITELY DETERMINED THE SCIENTIFIC AND TECHNICAL FEASIBILITY FOR USING ECE'S PROPRIETARY, REMOTELY OPERABLE, SENSORS AND TECHNIQUES FOR EARLY WARNING OF IMMINENT LIGHTNING THREATS AND FOR DISCONNECTION, AS PROPOSED BY ECE. A SPECIALLY INNOVATIVE SENSING TECHNIQUE HAS BEEN ADDITIONALLY DEvised IN THE PHASE I FEASIBILITY STUDY. FEASIBILITY ANALYSES HAVE DEMONSTRATED THAT WITH THIS TECHNIQUE SUBSTANTIAL IMPROVEMENT IN LEAD-TIME AND WARNING MARGINS IS POSSIBLE. ECE PROPOSES TO DESIGN, FABRICATE AND TEST AN EXPLORATORY DEVELOPMENT MODEL (EDM) OF THE LIGHTNING THREAT SENSING AND DISCONNECT SYSTEM IN VIENNA, VA. THE DESIGN ENVISAGES USE OF REMOTE SENSOR, LIGHTNING SURVIVABLE LEAD-IN, AND PERMITS REMOTE OPERATION WITHOUT THE USE OF OUTDOOR ELECTRICAL CIRCUITRY IN THE VICINITY OF THE NON-METALLIC,

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MINIATURE SENSING ELEMENT, THEREFORE WILL NOT PERTURB ANTENNA RADIATION PATTERNS. PRELIMINARY ON-SITE EXPERIMENTS WILL DETERMINE THE RANGE AND TYPE OF DETAILED OBSERVATIONS MADE TO CHARACTERIZE LOCAL LIGHTNING PHENOMENA. BASED ON THESE, DESIGN CHOICES OF THRESHOLD VALUES AND TIME MARGINS WILL BE MADE FOR LIGHTNING SENSING AND HIGH SPEED DISCONNECTION FOR GRADED LEVELS OF PROTECTION, EMP INVULNERABILITY AND SURVIVABILITY.

EIC LABS INC
111 DOWNEY ST
NORWOOD, MA 02062
CONTRACT NUMBER: DAAL01-87-C0738

DR K M ABRAHAM

TITLE:

HIGH ENERGY DENSITY CATHODES FOR RECHARGEABLE LITHIUM BATTERIES

TOPIC# 118 OFFICE: ETDL IDENT#: 15268

THE USEFULNESS OF TRANSITION METAL OXYSULFIDES AS HIGH ENERGY DENSITY, HIGH CYCLE LIFE CATHODES FOR SECONDARY Li BATTERIES WILL BE STUDIED. A FIRM FOUNDATION FOR THIS PHASE II RESEARCH AND DEVELOPMENT HAS BEEN LAID IN PHASE I WITH THE DISCOVERY OF THE NEW MOLYBDENUM OXYSULFIDE CATHODES MoOS(2). THE SYNTHESIS AND CHARACTERIZATION OF A VARIETY OF OTHER TRANSITIONAL METAL OXYSULFIDE CATHODES WILL BE UNDERTAKEN IN PHASE II. THE USEFULNESS OF THESE MATERIALS AS CATHODES FOR SECONDARY Li CELLS WILL BE ASSESSED BY CHARACTERIZING THEIR ELECTROCHEMICAL BEHAVIOR IN Li TEST CELLS. PROTOTYPE C-CELLS WILL BE FABRICATED WITH THE BEST OXYSULFIDE CATHODE IDENTIFIED. THE PERFORMANCE AND SAFETY FEATURES OF THE C-CELLS WILL BE STUDIED. A FULLY DEVELOPED Li/TRANSITION METAL OXYSULFIDE CELL IS EXPECTED TO HAVE >160 Wh/kg, MAKING IT SUITABLE FOR APPLICATIONS SUCH AS THE POWER SOURCE IN THE ARMY'S AN/PSG-2 DIGITAL MESSAGE DEVICE.

ELECTRO MAGNETIC APPLICATIONS INC
PO BOX 26263
DENVER, CO 80226

CONTRACT NUMBER: DAAL02-87-C-0091

DR RONAL W LARSON

TITLE:

NUMERICAL APPROACHES TO THE SOLUTION OF ELECTROMAGNETIC COUPLING/SCATTERING PROBLEMS

TOPIC# 60 OFFICE: HDL/LABCOM IDENT#: 18484

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A LOW-COST, HIGH-SPEED SPECIAL-PURPOSE COMPUTER WILL BE CONSTRUCTED FOR THE TIME ADVANCE OF MAXWELL'S EQUATIONS IN LARGE, COMPLEX, THREE-DIMENSIONAL PROBLEM SPACES. THE MACHINE IS PROJECTED TO ACHIEVE COMPUTATIONAL SPEEDS EXCEEDING THOSE OF ANY EXISTING SERIAL COMPUTER, WITH SUBSEQUENT MODELS AVAILABLE AT SUBSTANTIALLY LOWERED COST. THE FIRST FULL-SCALE MODEL WILL HANDLE PROBLEMS AT LEAST 200 CELLS ON A SIDE, REQUIRING APPROXIMATELY 240 MEGABYTES MEMORY. AN EVEN LARGER PROBLEM SPACE MAY BE POSSIBLE IN PHASE II, DEPENDING ON MEMORY COST AT THE TIME OF PURCHASE. SPEED IMPROVEMENTS, SIZE INCREASES AND COST IMPROVEMENTS ARE ACHIEVED USING FULL PIPELINING OF MAXWELL'S EQUATIONS, EMPLOYING SIMPLIFICATIONS AND ADVANCES DEVELOPED DURING PHASE I. THESE ADVANCES INCLUDE METHODS FOR HANDLING VIRTUALLY ANY TYPE OF PHYSICAL (INCLUDING LOSSY) MEDIUM, BOUNDARY CONDITION, AND SOURCE (INCLUDING HUYGENS' SOURCES), AND USE OF THIN WIRES AND THIN GAPS. PARALLELING A NUMBER OF PIPELINED MODULES WILL ALSO BE TRIED DURING THE CONSTRUCTION OF THE FIRST MOCKUP COMPONENTS.

ELECTRO-RADIATION INC

39 PLYMOUTH ST

FAIRFIELD, NJ 07006

CONTRACT NUMBER: DAAB07-87-C-P035

MURRAY W ROSEN

TITLE:

RESEARCH IN ARTIFICIAL INTELLIGENCE FOR NON-COMMUNICATION
ELECTRONIC WARFARE SYSTEMS

TOPIC# 291 OFFICE: CECOM/EW IDENT#: 17399

THE PROGRAM DEVELOPS AN EXPERT SUPERVISORY CONTROL TARGET UNIT AND SUPPORT WORKSTATION WITH REAL-TIME POWER MANAGEMENT ALGORITHMS FOR ADVANCED US ARMY EW APPLICATIONS. THE EFFORT CONSISTS OF DETAILED DEFINITION AND IMPLEMENTATION OF EXPERT SUPERVISORY CONTROL CONCEPTS WITH A DESIGN, DEVELOPMENT, TEST, DEMONSTRATION AND VERIFICATION OF PROOF-OF-PRINCIPLE IN FLYABLE EQUIPMENT. THE TARGET SYSTEM DESIGN EMBRACES STANDARDS INCLUDING THE VMEbus, ATR STYLE CHASSIS, THE 68020 MICROPROCESSOR, AND MIL-STD-1553B INTERFACE. THE WORKSTATION SERVES AS THE PLATFORM FOR CODE DEVELOPMENT AND CROSS-DEVELOPMENT TO THE TARGET, AND AS THE SUPPORT SYSTEM PROVIDING TARGET TESTING THROUGH SIMULATION OF THE SIGNAL ENVIRONMENT. THE WORKSTATION IS

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BUILT AROUND AN 80386 BASED PC HOST COMPUTER, A 68020 CO-PROCESSOR (TO SUPPORT CROSS-COMPILATION), AND UTILIZES A MIL-STD-1553B DATA BUS EXERCISER INSTRUMENT CONTROLLED VIA IEEE-488. THE EMBEDDED POWER MANAGEMENT ALGORITHM UTILIZES THREAT REPORTS TO DEVELOP THE ACTIVE THREAT LIST, DETERMINES TACTICAL GEOMETRY, APPLIES MISSION TACTICS AND STRATEGY, SELECTS TECHNIQUES, RESOLVES CONFLICTS, AND OPTIMIZES JAMMING EFFECTIVENESS FOR SCREENING APPLICATIONS. THE USER DATA FILE GENERATOR, IS A STAND-ALONE EXPERT SYSTEM WHICH PROVIDES GUIDANCE AND EXPERTISE TO AN OPERATOR TO CREATE OR MODIFY AN EXPERT DATA BASE FOR THE EW SYSTEM. THE PROJECT SUPPORTS FUTURE US ARMY EW REQUIREMENTS AND T&E OBJECTIVES WITH A FLEXIBLE AND REPROGRAMMABLE SYSTEM IMPLEMENTATION.

ENERGY OPTICS INC
224 N CAMPO
LAS CRUCES, NM 88001
CONTRACT NUMBER: DAMD17-87-C-7221
JEAN J ROBILLARD
TITLE:
SELF-DEVELOPMENT X-RAY FILM
TOPIC# 277 OFFICE: MEDICAL IDENT#: 17390

THE OBJECTIVE OF PHASE II RESEARCH WILL BE OPTIMIZATION OF THE PROCESSES DEVELOPED DURING PHASE I, DEVELOPMENT OF AN IMPROVED THERMAL PROCESSOR, SPECIFICALLY FOR THE NEW MATERIAL, PRODUCTION OF MATERIALS ON A SAMPLE BASIS AND SPECIFICATIONS FOR PROCESSES TO BE USED FOR FUTURE PRODUCTION. THE PROPOSED RESEARCH IS EXPECTED TO RESULT IN A HIGHLY ATTRACTIVE ALTERNATIVE TO SILVER HALIDE WITH MAJOR ADVANTAGES, ESPECIALLY FOR FIELD APPLICATIONS. THE OBJECTIVE OF PHASE I RESEARCH WAS TO PROVE THE FEASIBILITY OF A PROCESS TO PRODUCE A NEW, NON-SILVER, DRY PROCESS MATERIAL TO REPLACE SILVER HALIDE FILM FOR X-RAY RADIOGRAPHS, USING HIGH YIELD PHOTODISSOCIATION OF CHOLINE CHLORIDE. OVER TWENTY COMPOSITIONS WERE DESIGNED. THREE OF THESE GAVE THE BEST RESULTS. THE RESULTS WERE HIGHLY ENCOURAGING. GOOD HIGH CONTRAST, BLACK IMAGES WERE OBTAINED WITH SENSITIVITIES SUPERIOR TO SILVER HALIDE FILMS WITHOUT SCREEN. THE RESULTANT EMULSIONS ARE NOT SENSITIVE TO VISIBLE LIGHT AND REQUIRE ONLY HEAT DEVELOPMENT WITHOUT CHEMICALS OF ANY KIND.

ERDAS INC
430 TENTH ST NW - STE N-206
ATLANTA, GA 30318
CONTRACT NUMBER: DACA72-87-C-0007
LAWRIE E JORDAN III
TITLE:
DFAD PLUS
TOPIC# 239 OFFICE: ETL/COE IDENT#: 16948

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THE PHASE II DFAD-PLUS WORKPLAN FOCUSES ON FULLY INTEGRATING ALL ELEMENTS OF THE METHODOLOGY ORIGINALLY ESTABLISHED AND DEMONSTRATED UNDER PHASE I. THIS INCLUDES SPECIFIC EMPHASIS ON THE A/I BLACK-BOARD "FRONT-END" AS WELL AS THE DELIVERY, INSTALLATION, TRAINING, AND MAINTENANCE OF A TURN-KEY COMPUTER SYSTEM FOR INPUT, DISPLAY, SYNTHESIS, ANALYSIS OF DFAD AND OTHER DATA AS PART OF DFAD-PLUS. THE SYSTEM WILL BE BASED UPON A NEW SUN COMPUTER WHICH USES 386-PC TECHNOLOGY, SUN WINDOWS, AND THE SUN UNIX OPERATING SYSTEM WITH DOS WINDOW FUNCTIONALITY. THE SYSTEM CAN BE DIRECTLY CONNECTED VIA ETHERNET/NFS TO EXISTING GOVERNMENT SYSTEMS, AND IT WILL PROVIDED WITH FULL HARDWARE AND SOFTWARE SUPPORT FOR ONE YEAR. ALSO INCLUDED IS A COMPLETE TRAINING DATA BASE ALONG WITH TWO WEEKS OF ON-SITE TRAINING IN THE USE OF ALL ASPECTS OF THE HARDWARE AND SOFTWARE. ADDITIONAL SUPPORT IS AVAILABLE AS REQUIRED. A MORE DETAILED DESCRIPTION OF THE SYSTEM IS PROVIDED IN SECTION 3.2, DETAILED HARDWARE DESIGN. THE DFAD-PLUS APPLICATION SOFTWARE WILL BE BUNDLED AS A MODULE UNDER THE ERDAS IMAGE PROCESSING AND GIS SYSTEM, THEREFORE ALLOWING THE SYSTEM TO BE USED IN AN EXPANDED ROLE BEYOND JUST DFAD DATA ANALYSIS. THIS INCLUDES FULL IMAGE PROCESSING (1024 x 32 BIT TRUE COLOR) AS WELL AS TERRAIN ANALYSIS CAPABILITIES. FURTHER DISCUSSION OF THE SOFTWARE ARCHITECTURE FOR PHASE II IS DETAILED IN SECTION 2.1. THE WORKPLAN FOR PHASE II IS BROKEN DOWN INTO TASKS. THE NUMBER OF MAN-HOURS ASSOCIATED WITH EACH TASK CAN BE ADJUSTED TO MEET THE GOVERNMENT'S REQUIREMENTS. THE PROJECT IS DESIGNED TO COVER A TOTAL PERIOD OF APPROXIMATELY 18 MONTHS. THE TASKS ARE DESIGNED TO BE FLEXIBLE AND TO ACCOMMODATE THE POTENTIAL GOVERNMENT REQUIREMENT OF CROSSING FISCAL YEAR BOUNDARIES WITH FUNDING LIMITATIONS. PROGRESS REPORTS WILL BE FURNISHED ON A QUARTERLY BASIS. SECTION 1.4 PROVIDES DETAILED SCHEDULE INFORMATION.

FAILURE ANALYSIS ASSOCS

PO BOX 51470

PALO ALTO, CA 94303

CONTRACT NUMBER: DAAE07-87-C-8058

ERNEST D EASON

TITLE:

DIESEL ENGINE RELIABILITY/DURABILITY ALGORITHM/METHODOLOGY

TOPIC# 162 OFFICE: TACOM IDENT#: 17378

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THE OBJECTIVE OF PHASE II IS TO USE THE ALGORITHM DEVELOPED IN PHASE I IN THE DEVELOPMENT OF RELIABILITY AND MAINTENANCE OPTIMIZATION SOFTWARE, INCLUDING THE INTERFACES REQUIRED FOR THE SIMULATION MODULE TO USE THE FAULT TREE ANALYSIS RESULTS DIRECTLY. THE FAULT TREE ANALYSES WILL MODEL THE SUBSYSTEM AND COMPONENT RELIABILITY. THE SIMULATION MODULE WILL BE USED FOR SYSTEM LEVEL RELIABILITY AND MAINTAINABILITY PREDICTIONS AND ASSESSMENTS. IN ADDITION, THE SIMULATION WILL BE USED AS A TOOL IN DETERMINING THE OPTIMUM MAINTENANCE POLICY FOR THE VARIOUS DIESEL ENGINES UNDER EACH OPERATIONAL SCENARIO. THE RAMSIN SOFTWARE WILL BE DEVELOPED TO BE USED AS AN ENGINEERING MANAGEMENT TOOL FOR 1) PROJECTION AND MONITORING OF DIESEL ENGINE RAM-D CHARACTERISTICS FOR DEVELOPMENT ENGINES, 2) RAM-D ASSESSMENTS OF COMMERCIAL DIESEL ENGINES IN MILITARY ENVIRONNMENTS, 3) READINESS PREDICTIONS, AND 4) RAM-D AND LIFE CYCLE COST DECISIONS.

FERMIONICS CORP
9555 OWENSMOUTH AVE - STE 15
CHATSWORTH, CA 91311
CONTRACT NUMBER: DAAB07-87-C-F072
MUREN CHU
TITLE:
EPITAXIAL IR MATERIALS TECHNOLOGY FOR HIGH PERFORMANCE 2ND
GENERATION SYSTEMS
TOPIC# 310 OFFICE: CECOM/NV IDENT#: 17435

IN THE LAST 20 YEARS, HgCdTe PHOTOCONDUCTORS HAVE BEEN USED IN NUMEROUS IR SYSTEMS. FOR THE 2ND GENERATION IR SYSTEMS, HgCdTe PHOTOVOLTAIC DETECTORS WILL PLAY A VERY IMPORTANT ROLE. HOWEVER, WE ARE CURRENTLY FACING PROBLEMS THAT THE COST OF PRODUCING SUCH PV DETECTORS IS TOO HIGH AND THE YIELD IS TOO LOW. FINALLY, IT IS RECOGNIZED BY GOVERNMENT AND INDUSTRY THAT THE PROBLEMS ARE DUE TO THE LACK OF UNDERSTANDING AND ADEQUATE CONTROL OF THE BASIC HgCdTe MATERIALS. IN THE HgCdTe WORKSHOPS SPONSORED BY CNVEO, ESPECIALLY THE ONE ON SUBSTRATES AND HgCdTe EPILAYERS, IT IS AGREED BY ALL PARTICIPATING COMPANIES AND GOVERNMENT AGENCIES THAT CONTINUING GOVERNMENT SUPPORT ON SPECIAL TALENTS TO SOLVE THE EXISTING TECHNICAL PROBLEMS IS VERY CRUCIAL. IT WAS ALSO AGREED THAT SMALL COMPANIES

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SHOULD BE SUPPORTED SO THAT THEY CAN SUPPLY BETTER MATERIALS. IN THIS PROPOSAL, WE PROPOSE TO USE EXPERIMENTS AND THEORETICAL ANALYSIS TO UNDERSTAND THE FUNDAMENTAL DEFECT PROPERTIES OF THE MATERIAL. WE ALSO PROPOSE METHODS IN PRODUCING HgCdTe LPE LAYERS WITH THE HIGHEST CRYSTALLINE QUALITY. ONCE THESE MATERIALS ARE PRODUCED AND DOPED WITH IMPURITIES, DIFFUSED DIODES WILL BE MADE AND CHARACTERIZED. FROM THE ARRAY PROPERTIES, WE WILL DETERMINE THE MATERIAL CRITERIA FOR DEVICE APPLICATION. SUCH MATERIAL WILL THEN BE SUPPLIED TO THE INDUSTRY FOR DEVICE AND SYSTEM APPLICATIONS.

FIBERTEK INC
510-A HERNDON PKWY
HERNDON, VA 22070
CONTRACT NUMBER: DAAB07-87-C-F096
DR HORACIO VERDUN
TITLE:
DEVELOPMENT OF A WAFER LEVEL PHOTODIODE ARRAY TESTER BASED
ON THE TUNNELING CURRENT PROBE
TOPIC# 306 OFFICE: CECOM/NV IDENT#: 17428

IN PHASE I OF FIBERTEK, INC.'S EFFORT ENTITLED "TUNNELING CURRENT PROBE FOR NONCONTACT WAFER-LEVEL PHOTODIODE ARRAY TESTING" IT HAS BEEN FOR THE FIRST TIME DEMONSTRATED, THAT THE TUNNELING CURRENT PROBE CAN UNIQUELY DETERMINE THE THREE KEY CHARACTERISTICS OF A PHOTODIODE, NAMELY THE I-V CURVE, SPECTRAL RESPONSIVITY, AND DYNAMIC RESISTANCE. ADVANTAGES OF THE TUNNELING CURRENT PROBE OVER OTHER COMPETING TECHNIQUES (FOR EXAMPLE E-BEAM PROBING) INCLUDE ELIMINATION OF MATERIAL DAMAGE, LOW HEAT DEPOSITION, THE CAPABILITY FOR WORKING IN AIR AND THE SIMPLICITY OF THE PROBE ITSELF THAT TRANSLATE INTO LOWER PRODUCTION COSTS. BY USING A VACUUM CHAMBER AND COLD SHIELD, THE SYSTEM IS EQUALLY CAPABLE OF TESTING PHOTODIODES SUCH AS HgCdTe AT THEIR CRYOGENIC OPERATING TEMPERATURE. IN PHASE II, BASED UPON THE PHASE I RESULTS, FIBERTEK, INC. PROPOSES DESIGN, FABRICATION AND TESTING OF A PROTOTYPE DEMONSTRATOR IMPLEMENTING THE BASIC MEASUREMENT PARAMETERS FOR AN EIGHT PHOTODIODE PER SECOND THROUGHPUT.

FIBERTEK INC
510-A HERNDON PKWY
HERNDON, VA 22070
CONTRACT NUMBER: DAAB07-87-C-F074
DR RALPH BURNHAM
TITLE:
TUNABLE MID-INFRARED LASER SOURCE
TOPIC# 314 OFFICE: CECOM/NV IDENT#: 17443

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IN PHASE I OF FIBERTEK, INC.'S SBIR EFFORT ENTITLED "SOLID STATE MID-INFRARED LASER SOURCE", THE FEASIBILITY OF USING POTASSIUM TITANYL PHOSPHATE AS AN OPTICAL PARAMETRIC CONVERTER WAS DEMONSTRATED FOR THE FIRST TIME. IN PHASE II, BASED ON PHASE I RESULTS, FIBERTEK, INC. PROPOSES TO DEVELOP AN EFFICIENT OPTICAL PARAMETRIC OSCILLATOR/AMPLIFIER SYSTEM WITH A TUNING RANGE BETWEEN 1.5 AND 4.2 μm . THE OPO/OPA SYSTEM WILL PROVIDE RAIDATION IN THREE IMPORTANT ATMOSPHERIC TRANSMISSION BANDS. THE SYSTEM WILL BE DEVELOPED TO OPTIMIZE CONVERSION EFFICIENCY FOR A PUMP LASER BASED ON Nd(3+) AT 1.06 μm . IN THIS WAY, USING A DIODE-ARRAY-PUMPED Nd LASER AN OVERALL EFFICIENCY OF GREATER THAN 1% CAN BE REACHED IN AN ADVANCED LASER SYSTEM. A NEW MATERIAL KTA (POTASSIUM TITANYL ARSENATE) OFFERING HIGHER GAIN AND TUNABILITY TO 5 MICRONS WILL ALSO BE INVESTIGATED FOR OPTICAL PARAMETRIC CONVERSION.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: DACA39-87-C-0042
ARNIS MANGOLDS
TITLE:
DEVELOPMENT OF PRODUCTION SPT HAMMER SYSTEM AND PROTOTYPE
SPT CALIBRATOR/ANALYZER INSTRUMENT
TOPIC# 263 OFFICE: WES IDENT#: 16988

THE DEVELOPMENT OF A PRODUCTION SPT HAMMER SYSTEM WHICH ELIMINATES MOST OPERATOR AND DRILL RING INDUCED ERRORS, AND THE DEVELOPMENT OF A PROTOTYPE SPT CALIBRATOR/ANALYZER INSTRUMENT CAPABLE OF MEASURING ACTUAL SPT SYSTEM EFFICIENCIES RATHER THAN COMPARATIVE SOIL STRENGTH, IS PROPOSED. THE FOSTER-MILLER PROTOTYPE SPT HAMMER SYSTEM, DEVELOPED IN THE PHASE I SBIR, HAS PROVEN TO BE REPEATABLE, CONSISTENT, AND RELIABLE, THE DEVELOPMENT OF A PRODUCTION SPT HAMMER SYSTEM INVOLVES THE REDESIGN AND FURTHER TESTING, BOTH IN THE LABORATORY AND IN THE FIELD, OF THIS PROTOTYPE SPT HAMMER SYSTEM. IN THE COURSE OF THE PHASE I EFFORT, IT BECAME OBVIOUS THAT THE PRESENT SPT CALIBRATION SYSTEM DOES NOT MEASURE ACTUAL SPT SYSTEM EFFICIENCY, AND THAT A NEW INSTRUMENT CAPABLE OF MEASURING TOTAL ENERGY IN THE DRILL STRING REGARDLESS OF AND (SOIL) CONDITION WAS NECESSARY BEFORE THE

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ACTUAL SPT SYSTEM EFFICIENCY COULD BE MEASURED. INSTRUMENTATION AND MEASUREMENT TECHNIQUES DEVELOPED IN PHASE I WILL BE AUGMENTED WITH ADDITIONAL TRANSDUCERS. A COMPLETE DYNAMIC MODEL OF THE SPT SYSTEM, HAMMER/ANVIL/DRILL STRING, WILL BE DEVELOPED, AND FROM THAT MODEL, A PROTOTYPE INSTRUMENT COMPLETE WITH SYSTEM "OBSERVERS" WILL BE DEVELOPED. THIS PROTOTYPE INSTRUMENT WILL LEAD DIRECTLY TO A PHASE III PRODUCTION SPT CALIBRATOR/ANALYZER INSTRUMENT.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: DAAD05-87-C-0087
JOHN F McCOY
TITLE:
COMBAT VEHICLE TRACK TEMPERATURE SENSOR
TOPIC# 182 OFFICE: TECOM IDENT#: 17368

THE TRACK PADS OF COMBAT VEHICLES, ESPECIALLY TANKS IN HIGH SPEED MOTION ON PAVE SURFACES, UNDERGO BUILDUPS IN TEMPERATURE IN EXCESS OF 300 DEG F LEADING TO PREMATURE FAILURE OF THE MATERIALS. A METHOD OF MEASURING THE TRACK PAD TEMPERATURE WHILE THE VEHICLE IS IN MOTION IS NEEDED. THE PHASE I PROGRAM DEMONSTRATED THE FEASIBILITY FOR NON-CONTACT MONITORING OF TEMPERATURES BETWEEN 150 DEG F AND 500 DEG F THROUGH A FLUORIDE GLASS OPTICAL FIBER (TRANSMITTING IN THE MID INFRARED) COUPLED TO A SIMPLE THERMOPILE DETECTOR. THE OBJECTIVE OF THE PHASE II PROGRAM IS TO DEVELOP A RUGGED SENSOR USING THIS CONCEPT FOR MONITORING TRACK TEMPERATURES IN REAL TIME WHILE THE VEHICLE IS MOVING. THE THERMOPILE DETECTOR AND ELECTRONICS WILL BE SAFELY MOUNTED ON THE OUTSIDE OF THE TANK FENDER AND THE PROBE EXTENDS AROUND THE FENDER SUCH THAT THE TIP VIEWS THE MOVING TRACK FROM A STANDOFF DISTANCE OF APPROXIMATELY 2 TO 4 INCHES. THE MAJOR EFFORT WILL BE IN THE DESIGN OF THE FIBER OPTICS UNIVERSAL BUNDLE AND MOUNT, DETECTOR ASSEMBLY, DATA LOGGER, AND VIBRATION ABSORBER ASSEMBLY. A PROTOTYPE UNIT AND 12 DEMONSTRATION UNITS WILL BE FABRICATED AND EVALUATED. NO FUNDAMENTAL IMPEDIMENT EXISTS THAT SHOULD PRECLUDE THE DEVELOPMENT OF THE SENSOR.

GENERAL NETWORK CORP
25 SCIENCE PK
NEW HAVEN, CT 06511
CONTRACT NUMBER: DAAB07-87-C-A038
DR JASON LIU
TITLE:
ADVANCED FACILITIES TO EXPEDITE DESIGN AND EVALUATION OF COMMUNICATIONS SYSTEMS
TOPIC# 302 OFFICE: CECOM/CA IDENT#: 17420

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THE ULTIMATE OBJECTIVE OF THIS PROJECT IS TO MODIFY GENERAL NETWORK'S SOFTWARE SYSTEM, CADNET, FOR MILITARY USE AS AN ADVANCED FACILITY TO EXPEDITE THE DESIGN AND EVALUATION OF COMMUNICATIONS SYSTEMS. PHASE I ESTABLISHED THE FEASIBILITY OF THIS CONCEPT; PHASE II IS THE IMPLEMENTATION. CADNET IS AN INNOVATIVE, MODULARIZED, INTERACTIVE GRAPHICS SYSTEM DEVELOPED FOR COMMERCIAL USE IN DESIGNING, EVALUATING, AND OPTIMIZING THE FIRST APPLICATION FOR CADNET WILL BE THE DESIGN AND EVALUATION OF MOBILE SUBSCRIBER EQUIPMENT (MSE) NETWORKS. CADNET IS AN EXISTING SOFTWARE PRODUCT WITH PROVEN COMMERCIAL SUCCESS IN THE SOLUTION OF COMPLEX COMMUNICATIONS NETWORK PROBLEMS, INCLUDING NETWORK RELIABILITY, SURVIVABILITY, SECURITY, AND THE OPTIMIZATION OF NETWORK COMPONENT INTERCONNECTIONS. PHASE II OBJECTIVES ARE TO: 1) DEVELOP A DETAILED DEFINITION OF THE SPECIFIC FUNCTIONALITY REQUIRED FOR MSE COMMUNICATIONS SYSTEMS DESIGN. 2) TEST, REFINE, AND IMPLEMENT THE RECOMMENDED ALGORITHMS AND MODEL PARAMETERS FROM PHASE I FOR THE MATHEMATICAL MODELING OF MSE NETWORKS. 3) PRODUCE AND DELIVER A WORKING PROTOTYPE SYSTEM, CADNET WITH ITS NEW MSE ANALYTICAL MODULE. 4) IDENTIFY AND PRIORITIZE ADDITIONAL DEVELOPMENT AREAS TO ENHANCE THE CADNET MODELING TOOL FOR THE DESIGN AND ANALYSIS OF OTHER ARMY COMMUNICATIONS SYSTEMS.

GEO-CENTERS INC
7 WELLS AVE
NEWTON CENTRE, MA 02159
CONTRACT NUMBER: DAAL01-87-C-0742
E D PETROW/B NELSON
TITLE:
OPTICALLY ISOLATED SENSORS FOR MEGAWATT COMPONENTS
TOPIC# 131 OFFICE: ETDL IDENT#: 15325

THE GOAL OF THE PHASE II PROGRAM IS TO DEVELOP A FAMILY OF ELECTRICALLY PASSIVE FIBER OPTIC VOLTAGE SENSORS FOR USE AT ETDL'S PULSED POWER FACILITY. THE SENSORS WILL HAVE PERFORMANCE CAPABILITIES NOT PRESENTLY ACHIEVED IN STANDARD HIGH VOLTAGE MEASUREMENT INSTRUMENTATION, BUT WHICH ARE REQUIRED BY RESEARCHERS INVOLVED IN PULSE POWER RESEARCH AND SYSTEM DEVELOPMENT, WEAPONS TEST AND DEVELOPMENT, EMI AND EMP SHIELDING, AND MEGAWATT COMPONENT DESIGN AND DEVELOPMENT.

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THREE DIFFERENT FIBER OPTIC VOLTAGE SENSORS WILL BE DEVELOPED DURING THE PHASE II PROGRAM. THESE SENSORS WILL BE IMMEDIATELY COMPATIBLE WITH THE FIBER OPTIC DATA TRANSMISSION LINES BEING INSTALLED IN ETDL'S PULSED POWER FACILITY. A SUM-DIFFERENCE OUTPUT DETECTION SCHEME WILL BE INCORPORATED IN THE SENSORS TO MAKE THEIR OUTPUT INSENSITIVE TO SOURCE LIGHT INTENSITY VARIATIONS, MICROBENDING LOSSES AND RADIATION FIBER DARKENING. ADDITIONALLY, THE PROPOSED FIBER OPTIC SENSORS ARE IMMUNE TO THE ADVERSE EFFECTS OF EMI AND EMP PRESENT IN MANY RESEARCH, DEVELOPMENT AND TEST ENVIRONMENTS. SENSOR MEASUREMENT PROPERTIES INCLUDE A LINEAR VOLTAGE SENSING RANGE BETWEEN -40 kV AND 40 kV, A MEASUREMENT BANDWIDTH CAPABILITY BETWEEN DC AND 2 GHz, AND A VOLTAGE MEASUREMENT RESOLUTION OF BETTER THAN 10 V. DURING THE PHASE II EFFORT, FIBER OPTIC BASED VOLTAGE SENSING SYSTEMS WILL BE DESIGNED, FABRICATED, FIELD TESTED, AND DELIVERED TO ETDL'S PULSED POWER FACILITY.

GRADIENT LENS CORP
207 TREMONT ST
ROCHESTER, NY 14608
CONTRACT NUMBER: DAAA21-87-C-0123
LELAND G ATKINSON III
TITLE:
APPLICATION AND COMPARISON OF ASPHERE AND GRADIENT INDEX
TECHNOLOGIES
TOPIC# 2 OFFICE: ARDEC IDENT#: 17235

DURING THE PHASE I PORTION OF THIS SBIR PROGRAM, IT WAS FOUND THAT THE ADDITION OF AN ASPHERIC SURFACE OR AN AXIAL GRADIENT IN THE OBJECTIVE LENSES OF A 4x RIFLESCOPE IMPROVED THE PERFORMANCE OF THE OPTICAL SYSTEM. IT WAS ALSO DETERMINED THAT THE AXIAL GRADIENT HAD SOMEWHAT BETTER PERFORMANCE THAN THE ASPHERIC. THE PURPOSE OF THIS PHASE IS TO CONSTRUCT EACH ONE OF THESE SYSTEMS AND TO DETERMINE WHICH ONE WILL IN FACT BE BETTER BOTH IN TERMS OF ITS FINAL COST AND ITS EASE IN MANUFACTURING. THE ASPHERIC SYSTEM WILL BE BASED ON SURFACES PRODUCED BY OUR COMPUTER AIDED MANUFACTURING MACHINE ORIGINALLY DEVELOPED BY THE UNIVERSITY OF ROCHESTER UNDER THE SPONSORSHIP OF PICATINNY ARSENAL. THE AXIAL GRADIENT SYSTEM WILL BE BASED ON GLASSES DEVELOPED EARLIER UNDER A SEPARATE SBIR PROGRAM SPONSORED BY THE NATIONAL SCIENCE FOUNDATION.

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H&N INSTRUMENTS INC
PO BOX 955
NEWARK, OH 43055
CONTRACT NUMBER: DAAH01-87-C-0924
DR GARY M NISHIOKA
TITLE:

A COMPREHENSIVE INVESTIGATION OF THE INTERACTION OF WATER WITH
OPTICAL FIBERS

TOPIC# 155 OFFICE: MICOM IDENT#: 18209

THE DEGRADATION IN OPTICAL AND MECHANICAL PROPERTIES OF FIBERS CAUSED BY ATMOSPHERIC WATER IS A SERIOUS PROBLEM. LITTLE IS KNOWN, HOWEVER, OF THE TYPES AND QUANTITIES OF WATER ACTUALLY ASSOCIATED WITH OPTICAL FIBERS, AND THE MECHANISM FOR THE DELETERIOUS EFFECT OF THESE STATES OF WATER. IN PHASE I A NOVEL INSTRUMENT, COINED THE ETA, WAS CONSTRUCTED, AND WAS SHOWN TO BE SUFFICIENTLY SENSITIVE TO MEASURE THE MINUTE QUANTITIES OF WATER ASSOCIATED WITH OPTICAL FIBERS. CLEAR DIFFERENCES IN THE STATES AND QUANTITIES OF WATER BOUND TO DIFFERENT OPTICAL FIBERS WERE REVEALED. THE PHASE II PROGRAM WILL INVOLVE A COMPREHENSIVE INVESTIGATION OF THE INTERACTION OF OPTICAL FIBERS WITH ATMOSPHERIC WATER. THE EFFECT OF TEMPERATURE, HUMIDITY, BENDING STRESS, ADHESIVE, AND FIBER COATING ON THE KINETICS AND THERMODYNAMICS OF THIS INTERACTION WILL BE EXPLORED. THE MEANING OF AGGRAVATED WETTING TESTS WILL ALSO BE STUDIED. THE PHASE II PROGRAM WILL UTILIZE THE ETA, AS WELL AS A FIBER WETTING BALANCE. ADDED AS OPTICS ARE DEUTERIUM EXCHANGE STUDIES FOR INTERPRETATION OF ETA AND KINETIC DATA, AND INVERSE GAS CHROMATOGRAPHY FOR SURFACE ACID/BASE STUDIES.

IAP RESEARCH INC
2763 CULVER AVE
DAYTON, OH 45429
CONTRACT NUMBER: DAAD05-87-C-0089
DAVID P BAUER
TITLE:

BALLISTIC SHOCK SIMULATOR

TOPIC# 185 OFFICE: TECOM IDENT#: 18212

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WE DEMONSTRATED ON ELECTROMAGNETICALLY DRIVEN BALLISTIC SHOCK SIMULATOR IN PHASE I. IN PHASE II WE WILL DESIGN, FABRICATE, AND TEST A BALLISTIC SHOCK SIMULATOR PROTOTYPE. THE PROTOTYPE UNIT WILL BE CAPABLE OF GENERATING SHOCK PULSES WITH EQUIVALENT STATIC ACCELERATION LEVELS UP TO ONE MEGAGEE WITH FREQUENCY CONTENT PEAKING UP TO 80 kHz AND CONTINUING TO 1 mHz.

ICE CORP
240 LEVEE DR
MANHATTAN, KS 66502
CONTRACT NUMBER: DAAK70-87-C-0032
WILLIAM H DAWES
TITLE:

THE DEVELOPMENT OF A FAMILY OF HYBRID CIRCUIT POWER SWITCHES INCLUDING DRIVE AND PROTECTION NETWORKS

TOPIC# 141 OFFICE: BRDEC IDENT#: 15168

THE ICE CORPORATION PROPOSES TO DESIGN AND MANUFACTURE A FAMILY OF POWER HYBRID CIRCUIT DC SWITCHES, INCLUDING OPTICAL-ISOLATION, OVER-CURRENT AND OVER-TEMPERATURE PROTECTION AND DRIVE NETWORKS. THE FIRST STEP OF PHASE II WILL BE TO IMPROVE THE SWITCH DESIGNED AND FABRICATED DURING PHASE I. THIS INCLUDES IMPROVEMENTS IN SWITCHING SPEEDS, SWITCHING DELAYS AND REDUCING PROTECTION THRESHOLD VARIATIONS WITH TEMPERATURE AND POWER SUPPLY VOLTAGE. THE NEXT STEP WILL BE THE DESIGN OF A FAMILY OF APPROXIMATELY FIVE SWITCHES WITH A CURRENT CAPACITY RANGE OF FROM 1 TO 50 AMPERES, ALTHOUGH EXCEEDING 50 AMPERES WILL BE INVESTIGATED. AN ATTEMPT TO EXTEND PHASE I'S 32 VOLT OPERATING POTENTIAL TO 500 VOLTS WILL BE MADE. A MAJOR EFFORT WILL BE MADE TO ELIMINATE THE CURRENT-SENSE RESISTOR OF PHASE I BY USING CURRENT-SENSING FETS. THE OPTICAL-ISOLATION, CMOS AND TTL COMPATIBILITY OF PHASE I WILL BE MAINTAINED. VARIOUS HARMETIC PACKAGES WILL BE INVESTIGATED, INCLUDING THE TO-204 (TO-3) AND TO-213 (TO-66). CONFORMANCE WITH MIL-STD-833B WILL BE ATTEMPTED TO ENCOURAGE LATER GOVERNMENT PURCHASES.

II-VI INC
SAXONBURG BLVD
SAXONBURG, PA 16056
CONTRACT NUMBER: DAAB07-87-C-F088
KAI-YUNG LAY
TITLE:

DEVELOPMENT OF LARGE AREA CdTe ALLOYS AS LATTICE MATCHED SUBSTRATES FOR HgCdTe TECHNOLOGY

TOPIC# 310 OFFICE: NV IDENT#: 17436

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LARGE AREA, LATTICE-MATCHED, HIGH QUALITY CdTe ALLOY SUBSTRATES ARE CRITICAL TO THE DEVELOPMENT OF HIGH PERFORMANCE HgCdTe IR DETECTOR TECHNOLOGY. WE PROPOSE A LOW STRESS HORIZONTAL BRIDGMAN (HB) TECHNIQUE AS A SOLUTION TO MEET THESE REQUIREMENTS. A NEW FURNACE DESIGN IS PROPOSED THAT WILL SIGNIFICANTLY SCALE OUR WAFER SIZE CAPABILITY UP TO 4.5X5.0 cm(2). FAVORABLE LIQUID-SOLID INTERFACE GEOMETRIES CAN BE STUDIED AND ACHIEVED WITH THE AID OF 3-D THERMAL FINITE ELEMENT ANALYSIS (TFEA). THIS WILL ACCELERATE OUR RELIABLE SEEDED GROWTH CAPABILITY AND IMPROVE SINGLE CRYSTAL FIELD. IN ORDER TO PRODUCE RELIABLE HIGH QUALITY CRYSTALS, LOW THERMAL GRADIENTS, LOW STRESS ENVIRONMENTS AND STOICHIOMETRY CONTROL ARE THREE MAJOR TASKS TO BE ADDRESSED DURING PHASE II CONTACT. BOTH LOW THERMAL GRADIENT AND LOW STRESS ENVIRONMENT COULD SIGNIFICANTLY REDUCE ETCH PIT DENSITY (EPD) TO 10(3) cm(-2) RANGE. THE STOICHIOMETRY, AS ADJUSTED BY EXCESS Cd VAPOR PRESSURE, CAN CONTRIBUTE TO OUR UNDERSTANDING AND CONTROL OF PRECIPITATE FORMATION.

INDUSTRIAL QUALITY INC
PO BOX 2397
GAITHERSBURG, MD 20879
CONTRACT NUMBER: DAAK70-87-C0027
DANIEL POLANSKY

TITLE:

DEVELOPMENT OF REFERENCE RADIOGRAPHS FOR ALUMINUM WELDS
TOPIC# 146 OFFICE: BRDEC IDENT#: 15201

A STANDARD DOCUMENT OF GRADED REFERENCE RADIOGRAPHS OF ALUMINUM WELDS IS NEEDED TO MINIMIZE INTERPRETATION PROBLEMS RELATED TO THE ACCEPTANCE OF ALUMINUM WELDS IN MILITARY AND CIVILIAN STRUCTURES. THE REFERENCE RADIOGRAPHS WILL ALLOW THE PRODUCER AND THE BUYER TO AGREE ON A GIVEN GRADED REFERENCE RADIOGRAPH AS AN ACCEPTANCE QUALITY LEVEL AND WILL ALSO AID THIRD PARTY OBSERVERS TO AUDIT AND EVALUATE THE WELD QUALITY LEVEL PRODUCED. THE PROGRAM OBJECTIVE IS TO DEVELOP SETS OF GRADED REFERENCE RADIOGRAPHS FOR ALUMINUM WELDS (5000 TO 6000 SERIES ALLOYS) IN THE THICKNESS RANGES 0 TO 9.5mm (.375 INCH) AND 9.5 TO 19mm (.375 TO .75 INCH). THE DOCUMENTS WILL INCLUDE TRANSPARENCY REPRODUCTIONS OF WELD RADIOGRAPHS AND TEXT DESCRIBING THE WELDS AND DISCONTINUITIES. FAULTED WELDS WILL BE PREPARED TO BACK UP THE

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STANDARD DOCUMENTS. WELD DISCONTINUITIES WILL INCLUDE FIVE GRADES EACH OF FINE SCATTERED POROSITY, COARSE SCATTERED POROSITY AND LINEAR POROSITY, THREE GRADES OF CLUSTERED POROSITY, TWO ILLUSTRATIONS EACH OF INADEQUATE PENETRATION AND TUNGSTEN INCLUSION AND EXAMPLES OF LONGITUDINAL, TRANSVERSE, AND CRATER CRACKS, LACK OF FUSION AND UNDERCUT. DILIGENT EFFORTS WILL BE MADE TO OBTAIN CONSENSUS STANDARDS THROUGH A PROFESSIONAL SOCIETY SUCH AS ASTM OR AWS.

INTEGRATED CHEMICAL SENSORS CORP
44 MECHANIC ST
NEWTON, MA 02164

CONTRACT NUMBER: DAAA15-87-C-0047

DR GLENN J BASTIAANS

TITLE:

ELECTROPHORETIC DESORPTION FOR THE REGENERATION OF
IMMUNOLOGICALLY ACTIVE SENSOR SURFACES

TOPIC# 28 OFFICE: CRDEC IDENT#: 17273

THE EXTENSION OF ELECTROPHORETIC DESORPTION AS A TECHNIQUE FOR THE REGENERATION OF IMMUNOLOGICALLY ACTIVE SURFACES UTILIZED WITH IMMUNOLOGICALLY BASED SENSOR SYSTEMS UNDER DEVELOPMENT AT THE U.S. ARMY CRDEC IS PROPOSED. PHASE I WORK HAS INDICATED THE REGENERATION OF IMMUNOLOGICALLY ACTIVE SURFACES WAS VERY FEASIBLE FOR THE ANTIGEN/ANTIBODY PAIRS TESTED. THIS SUCCESSFUL TECHNIQUE NOW WILL BE EXTENDED TO REGENERATION OF ACTIVE SURFACES FOR THE FIBER OPTIC SENSING SYSTEM AND THE LIGHT ADDRESSABLE POTENTIAL METRIC ARRAY SENSING SYSTEM BEING DEVELOPED BY THE CRDEC IN CONJUNCTION WITH OUTSIDE VENDORS. INITIAL OPTIMIZATION AND TESTING OF THE IMPROVED ELECTROPHORETIC SYSTEMS TO BE DESIGNED WILL TAKE PLACE AT THIS CONTRACTOR'S FACILITIES USING REALISTIC ANTIGEN/ANTIBODY PAIRS. FINALLY HOWEVER, PROTOTYPE ELECTROPHORETIC SYSTEMS WILL BE DESIGNED AND FABRICATED FOR USE WITH THE SENSING SYSTEMS UNDER TEST AT THE CRDEC. THE SURFACE REGENERATION SUBSYSTEMS WILL BE MECHANICALLY, ELECTRICALLY, AND OPERATIONALLY COMPATIBLE WITH THE CRDEC EQUIPMENT. TESTING OF THE EFFICIENCY OF THE ELECTROPHORETIC DESORPTION SURFACE REGENERATION EQUIPMENT ON THE CRDEC SENSING SYSTEMS WILL BE DONE AT THE CRDEC.

INTEGRATED SYSTEMS INC
2500 MISSION COLLEGE BLVD
SANTA CLARA, CA 95054
CONTRACT NUMBER: DAAA21-87-C-0101
SUNIL C SHAH

TITLE:

ADAPTIVE WEAPON TRACKING TESTBED

TOPIC# 1 OFFICE: ARDC IDENT#: 17233

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POINTING CONTROL OF A WEAPON SYSTEM MOUNTED ON A MOVING PLATFORM
POSES GENERIC CONTROL PROBLEMS FOUND ON TANKS, HELICOPTERS,
ARMORED VEHICLES, SHIPS AND SPACECRAFTS. THE PROPOSED ADAPTIVE
CONTROL TESTBED PROVIDES TOOLS SO THAT VARIOUS CANDIDATE CONTROL
METHODOLOGIES CAN BE TRIED OUT UNDER WELL DEFINED CONDITIONS. THE
OBJECTIVE OF THE TESTBED FACILITY IS TO BE ABLE TO DESIGN, DEVELOP,
TEST AND VALIDATE WEAPON SYSTEM CONTROL STRATEGIES SO THAT A HIGH
DEGREE OF CONFIDENCE CAN BE ESTABLISHED IN TRANSFERRING THE
STRATEGIES SO THAT A HIGH DEGREE OF CONFIDENCE CAN BE ESTABLISHED IN
TRANSFERRING THE STRATEGIES TO TEST VEHICLES AND OPERATIONAL SYSTEMS.
THE PROPOSED EFFORT WILL RESULT IN (1) ADVANCED SOFTWARE TOOLS FOR
RAPID DESIGN OF ADAPTIVE AND MODERN CONTROL OF WEAPON SYSTEMS, (2)
ADVANCED MULTI-PROCESSOR HARDWARE CAPABLE OF THROUGHPUTS IN THE
RANGE OF 200 MFLOPS WHICH CAN BE PROGRAMMED DIRECTLY FROM BLOCK-
DIAGRAM SPECIFICATIONS USING STATE-OF-THE-ART COMPUTER-AIDED
SOFTWARE ENGINEERING (CASE) TOOLS AND (3) A WEAPON SYSTEM PROTOTYPE
WITH PRECISELY KNOWN AND ADJUSTABLE DYNAMICS CHARACTERISTICS. THESE
THREE COMPONENTS WILL BE INTEGRATED IN THE TESTBED FACILITY FOR RAPID
PROTOTYPING OF CONTROL STRATEGIES.

INTELLI-TEK INC

5640 NICHOLSON LANE - #208

ROCKVILLE, MD 20854

CONTRACT NUMBER: DAAD07-87-C-0101

BARRY G SILVERMAN

TITLE:

JAMS: A COMPUTER AIDED ELECTRONIC WARFARE VULNERABILITY
ASSESSMENT (EWVA) TECHNIQUE

TOPIC# 68 OFFICE: VAL

IDENT#: 17316

IT IS PROPOSED TO DEVELOP A COMPUTER-AIDED EWVA TECHNIQUE CALLED
JAMS TO INCREASE THE PRODUCTIVITY OF EWVA PROFESSIONALS IN THEIR
THEORETICAL/ASSESSMENT. JAMS WILL PROVIDE THIS SUPPORT SINCE IT IS
BASED ON THE CASE ORIENTED PROCESSING ENVIRONMENT (COPE) CONCEPT
WHICH INTEGRATES A NUMBER OF AI TECHNIQUES (E.G., LEARNING, BELIEF
MAINTENANCE, REASONING, AND KNOWLEDGE REPRESENTATION/PROPAGATION)
WITH MORE TRADITIONAL REPORT PREPARATION AND EWVA DECISION ANALYSIS
METHODS IN A FASHION THAT SUPPORTS THE MANAGEMENT AND EVOLUTION OF

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KNOWLEDGE AS A CASE PROCEEDS. JAMS WILL PROVIDE THE PROFESSIONAL WITH AN INTELLIGENT CASE OBJECT (ICO) BASED ON THE STRUCTURE OF AN EWVA CASE, THAT CAN GROW AND ADAPT WITH EACH NEW CASE ITS APPLIED TO; AND THAT WILL SERVE THE ELECTRONIC EXTENSION OF THE CREATIVE PROFESSIONAL'S PENCIL AND PAPER WORKSPACE. THIS IS A PROPOSAL TO DEVELOP VERSION JAMS VERSION 1.0 AND 1.1.

INTELLIGENT AUTOMATION INC
1715 GLASTONBERRY RD
ROCKVILLE, MD 20854
CONTRACT NUMBER: DAAA21-87-C-0106
DR LEONARD S HAYNES

TITLE:

A ROBOT VISION SYSTEM BASED ON PIPE AUGMENTED BY A MINIMAL STRUCTURED LIGHT SYSTEM

TOPIC# 7 OFFICE: ARDEC IDENT#: 17243

UNDER PHASE I FUNDING, WE HAVE INVENTED AN ENTIRELY NEW FORM OF ROBOT VISION SYSTEM WHICH WE CALL ILLUMINATION STEREO. THREE INDEPENDENT PATENT SEARCHES, AND DISCUSSIONS WITH SEVERAL LEADERS IN THE ROBOT VISION FIELD CONFIRM THAT THE CONCEPT IS NEW. ILLUMINATION STEREO ENABLES RANGE IMAGES TO BE PRODUCED FASTER AND EASIER THAN WITH THE PRIOR ART APPROACHES. WE HAVE DONE EXTENSIVE ANALYTICAL INVESTIGATION OF THE EXPECTED ACCURACY, AND HAVE BUILT AN INITIAL PROTOTYPE TO VERIFY OUR ANALYTICAL RESULTS, AND EMPIRICALLY EVALUATE THE SYSTEM PERFORMANCE.

INTERSPEC INC
1100 HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER: DAAL02-87-C-0068
MARK S PROKOP

TITLE:

DIGITAL BEAMFORMING RADAR WITH APPLICATION TO SPACE BASED BISTATIC RADAR DEVELOPMENT

TOPIC# 41 OFFICE: HDL/LABCOM IDENT#: 17288

FEASIBILITY OF REDUCING DIGITAL BEAMFORMING (DBF) RADAR HARDWARE

SUBMITTED BY

COMPLEXITY HAS BEEN SHOWN IN PHASE I. THE PROPOSED CONTINUATION OF THIS PROGRAM IS TO APPLY DIGITAL BEAMFORMING TO THE RECEIVER SUBSYSTEM OF A BISTATIC RADAR CONCEPT. THIS BISTATIC CONCEPT USES A SPACE BASED ILLUMINATOR WITH RECEIVERS LOCATED ON THE GROUND, IN GROUND VEHICLES OR IN FIXED WING OR ROTARY WING AIRCRAFT. THIS EFFORT COVERS (1) SPACE BASE RADAR SYSTEMS REQUIREMENT DEFINITION, (2) BATTLEFIELD BISTATIC RECEIVER AND WAVEFORM DESIGN, (3) COMMUNICATION SUBSYSTEM DESIGN, (4) DEFINITION OF A TEST BED TO INVESTIGATE TECHNICAL CAPABILITY, UTILITY, AND, TO DEMONSTRATE FEASIBILITY OF SPACE BASED BISTATIC RADAR.

J. K. RESEARCH
210 S WALLACE
BOZEMAN, MT 59715
CONTRACT NUMBER: DAAA15-87-C-0062
DR JOAN COMBIE
TITLE:
THERMOPHILIC MICROORGANISMS AS SOURCE OF HEAT STABLE GLUCOSE
OXIDASE AND PEROXIDASE
TOPIC# 29 OFFICE: CRDEC IDENT#: 17275

STABLE ENZYMES ARE ESSENTIAL TO DEVELOPMENT OF BIOSENSORS AND ASSAY REAGENTS FOR FIELD USE. GLUCOSE OXIDASE AND PEROXIDASE IN IMMUNOASSAYS AND HOME HEALTH CARE KITS MUST FUNCTION AT AMBIENT TEMPERATURES WHILE FOR SIGNAL AMPLIFICATION IN ELECTRONIC DEVICES THEY MUST OPERATE AT HIGHER TEMPERATURES. THESE ENZYMES MUST RETAIN ACTIVITY AFTER STORAGE FROM -50 DEG C TO 60 DEG C. FIVE MICROORGANISMS ISOLATED FROM EXTREME ENVIRONMENTS AND IDENTIFIED AS GOOD PRODUCERS OF STABLE GLUCOSE OXIDASE AND PEROXIDASE DURING PHASE I WILL BE STUDIED IN PHASE II. MICROBIAL ENZYME PRODUCTION WILL BE OPTIMIZED; THE ENZYMES WILL BE PURIFIED AND CHARACTERIZED. APPLICATIONS WORK ON BIOSENSORS AND IMMUNOASSAYS WILL BE DONE WITH SEVERAL POTENTIAL USERS.

KARTA TECHNOLOGY INC
1892 GRANDSTAND
SAN ANTONIO, TX 78238
CONTRACT NUMBER: DAAJ02-87-C-0010
DR G P SINGH
TITLE:
CERAMIC INSPECTION WORKSTATION
TOPIC# 37 OFFICE: AVSCOM IDENT#: 17284

SUBMITTED BY

CERAMICS ARE BEING WIDELY CONSIDERED FOR REPLACEMENT OF METALS AND POLYMERS IN MANY ENGINEERING APPLICATIONS. THEIR CORROSION RESISTANCE, SMALL COEFFICIENTS OF THERMAL EXPANSION, LIGHT WEIGHT, LOW COST, EXCELLENT MECHANICAL PROPERTIES UNDER HEAVY STRESS, OUTSTANDING ELECTRICAL AND OPTICAL PROPERTIES, AND EXCEPTIONAL RESISTANCE TO HIGH TEMPERATURE, MAKE THEM VERY ATTRACTIVE IN STRUCTURAL, MICROELECTRONIC, AND BIOTECHNOLOGY AREAS. DESPITE THEIR DESIRABLE PROPERTIES, USE OF CERAMICS IS GREATLY RESTRICTED IN STRUCTURAL APPLICATIONS BECAUSE CERAMICS ARE BRITTLE AND THEIR PHYSICAL PROPERTIES ARE NON-UNIFORM. TO ASSURE CERAMIC PRODUCT RELIABILITY, IT IS EXTREMELY IMPORTANT THAT THEY BE EXAMINED NONDESTRUCTIVELY. A CERAMIC INSPECTION WORKSTATION WHICH COMPRISES OF A ROBOTIC SYSTEM FOR POSITION ULTRASONIC TRANSDUCER, A COMPUTER CONTROLLED ULTRASONIC DATA ACQUISITION AND SIGNAL PROCESSING SYSTEM IS PROPOSED FOR RELIABLE DETECTION AND CHARACTERIZATION OF SURFACE BREAKING CRACKS, VOIDS AND INCLUSIONS IN THE SIZE RANGE OF 20 - 200 MICRONS.

KEM-TEK INC
PO BOX 1285
LINWOOD, PA 19061
CONTRACT NUMBER: DAAK70-87-C-0050
ROGER DESROSIER
TITLE:
FOAM/DECOYS
TOPIC# 137 OFFICE: BRDEC IDENT#: 15123

KEM-TEK PROPOSES TO FABRICATE AN OUTER SKIN OF A DECEPTION DEVICE FROM LIGHTWEIGHT FABRIC AND A THIN COATING OF FOAM INTIMATELY LAMINATED TO THE FABRIC TO IMPART DIMENSIONAL SHAPE AND INTEGRITY. THE OUTER FABRIC SKIN WOULD BE COLORED IN A CAMOUFLAGE GRAPHICS PATTERN DUPLICATING THAT OF THE DECEPTION DEVICE SELECTED BY THE GOVERNMENT, EG 5 TON TRUCK. THE OUTER FABRIC/FOAM SKIN WOULD THEN BE PATTERNED, SEWN/CEMENTED OR HEAT SEALED TO REPLICATE THE VEHICLE'S CONFIGURATION AND SUPPORTED INTERNALLY WITH FOAM/AIR BEAMS. KEM-TEK WOULD THEN DEPLOY THE DECEPTION DEVICE AND EVALUATE FORM, KIT, AND FUNCTION TO DETERMINE IF THE DEVICE SATISFIED USER REQUIREMENTS. THE FOAM AIR BEAMS WOULD BE DESIGNED TO OPERATE AS LOW PRESSURE (1 psig) DEVICES, AND WILL BE MANUFACTURED USING CYLINDRICAL FOAM

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LAMINATED TO THE URETHANE COATED NYLON, AS DESCRIBED IN THE PHASE I REPORT (CONCEPT II). THE BEAMS WOULD BE DESIGNED TO CONTAIN FLAPPER VALVES FOR PRESSURE RETENTION, AND QUICK DISCONNECTS FOR INFLATION/DEFLATION.

KSE INC
PO BOX 368
AMHERST, MA 01004
CONTRACT NUMBER: DAAA15-87-C-0070
DR J R KITTRELL
TITLE:
INSENSITIVE HTPB EXPLOSIVE BINDER
TOPIC# 79 OFFICE: BRL IDENT#: 16141

ARMY EXPLOSIVES NEED TO BE MADE LESS SENSITIVE AND LESS VULNERABLE TO SYMPATHETIC DETONATION AND FIRE. COST, PROCESSABILITY AND STABILITY ARE ALSO IMPORTANT. KSE HAS UNDER DEVELOPMENT A PROCESS FOR THE DIRECT NITRATION OF HYDROXYL TERMINATED POLYBUTADIENE (HTPB), A BINDER CURRENTLY IN USE FOR EXPLOSIVES AND PROPELLANTS. THE FUNCTIONAL GROUPS ADDED TO THE HTPB SHOULD INCREASE THE ENERGY DENSITY OF THE BINDER. MORE IMPORTANTLY, SENSITIVITY TEST PROCEDURES HAVE BEEN PERFORMED ON HIGHLY NITRATED HTPB AND ON ALKENE ANALOGS, SHOWING LOW SENSITIVITY TO FRICTION AND IMPACT. THE COMBINATION OF INSENSITIVITY, OXYGEN CONTENT, AND ENERGETIC PROPERTIES OF THE BINDER SHOULD GREATLY EXPAND THE EXPLOSIVE REFORMULATION OPTIONS TO PROVIDE LOW VULNERABILITY EXPLOSIVES AS ENERGETIC AS COMPOSITION B. THE COST EFFECTIVENESS AND PROCESSABILITY ARE ACHIEVED BY UTILIZATION OF AN EXISTING BINDER MATERIAL (HTPB) AND BY THE UTILITY OF EXISTING CAST-CURED EQUIPMENT. ALL TECHNICAL FEASIBILITY OBJECTIVES OF THE PHASE I PROGRAM HAVE BEEN MET. IN THE PROPOSED PROGRAM, SYNTHESIS PROCEDURES ARE TO BE OPTIMIZED, BINDER PROPERTIES ARE TO BE CHARACTERIZED, AND SAMPLES ARE TO BE SUPPLIED TO APG FOR EVALUATION. ELEMENTS OF THE PROGRAM WILL UTILIZE RESOURCES OF THE POLYMER SCIENCE DEPARTMENT OF THE UNIVERSITY OF MASSACHUSETTS.

LASER SCIENCE INC
26 LANDSDOWNE ST
CAMBRIDGE, MA 02139
CONTRACT NUMBER: DAAA15-87-C-0074
BRUCE THOMSON
TITLE:
MINIATURE LIDAR FOR STANDOFF DETECTION
TOPIC# 27 OFFICE: CRDC IDENT#: 17272

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LASER SCIENCE, INC. HAS IDENTIFIED A BASELINE SYSTEM FOR A MINIATURE LIDAR FOR STANDOFF DETECTION DURING THE PHASE I SBIR PROGRAM. THE BASELINE DESIGN BRINGS TOGETHER NEW TECHNOLOGY AND NOVEL CONCEPTS FOR EXTRACTION OF ENERGY ON LOW GAIN LINES, HIGH REP RATE FREQUENCY AGILITY AND ENHANCED CATALYST PERFORMANCE. THE SYSTEM MEETS THE PHASE I GOALS SET FOR PULSE ENERGY AND PULSE REPETITION RATE. THROUGH LABORATORY EXPERIMENTS, A PULSE ENERGY OF 100 mj HAS BEEN DEMONSTRATED ON WEAK LINES, SUCH AS 9P44, AND OVER 200 mj PER PULSE ON THE STRONGEST LINES. THE SYSTEM IS DESIGNED TO PRODUCE FOUR DIFFERENT CO(2) LINES DURING A 10 ms BURST WITH A SINGLE LASER. THE REQUIRED FREQUENCY AGILITY IS ACHIEVED BY INCORPORATING AN ADVANCED LINE TUNING DEVICE WHICH IS BEING DEVELOPED BY TELEDYNE CME WITH INTERNAL FUNDS. THE DESIGN IS ALSO BASED ON THE USE OF A NEWLY DEVELOPED CATALYST WHICH HAS DEMONSTRATED SUPERIOR PERFORMANCE IN LABORATORY TEST, INCLUDING OPERATION IN A -40C ENVIRONMENT. BASED ON THE SUCCESS OF THE PHASE I PROGRAM, A PHASE II PROGRAM IS PROPOSED WHICH WILL DEMONSTRATE THE VIABILITY OF A MINIATURE LIDAR SYSTEM FOR STANDOFF DETECTION. THE DEMONSTRATION WILL INCLUDE A BREADBOARD LASER AND FREQUENCY AGILE SYSTEM, AND IF POSSIBLE THE USE OF THE NEWLY DEVELOPED CATALYST AND SMALL POWER SUPPLIES. IT WILL ALSO BE DESIGNED TO OPERATE WITH A GFE RECEIVER, DETECTOR AND SIGNAL PROCESSING PACKAGE FOR DEMONSTRATION.

LB&M ASSOCS
111 SW "C" AVE - STE 200
LAWTON, OK 73501
CONTRACT NUMBER: DAAA21-87-C-0107
RON RHOADS
TITLE:
INTELLIGENT HOWITZER SELF-DEFENSE DECISION AID
TOPIC# 5 OFFICE: ARDC IDENT#: 17241

THIS PROJECT WILL DESIGN AND DEVELOP A PROTOTYPE EXPERT SYSTEM DECISION AID WHICH ASSISTS IN SEMI-AUTONOMOUS HOWITZER DEFENSE ACTIVITIES. THE PHASE I EFFORT LED TO THE DEFINITION OF A TECHNICALLY FEASIBLE DECISION AID WHICH COULD BE READILY INTEGRATED INTO THE ARDEC LABORATORY ENVIRONMENT. THE PHASE II EFFORT INCLUDES KNOWLEDGE ENGINEERING, FUNCTIONAL REQUIREMENTS ANALYSIS, KNOWLEDGE

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BASE/INFERENCE ENGINE CONSTRUCTION, PROTOTYPING, FUNCTION, EMULATION, SYSTEM DISPLAY AND CONTROL, AND SIMULATION. SUBSTANTIVE KNOWLEDGE WILL BE INCREASED THROUGH THE DETAILED DEFINITION OF TIME-SENSITIVE MILITARY DECISION-MAKING PROCESSES. METHODOLOGICAL ADVANCEMENT WILL BE ACHIEVED THROUGH A METHODOLOGY WHICH ACCURATELY DEFINES OPERATIONAL PROCESSES AND DATA FLOWS; WHICH PRECISELY EMULATES HOWITZER SYSTEM FUNCTIONS AND WHICH ACCURATELY SIMULATES THE MODERN BATTLEFIELD. TECHNICAL INNOVATION WILL BE ACHIEVED THROUGH THE PROTOTYPING OF A HYBRID SYSTEM ON A MICROCOMPUTER.

LIGHTING SCIENCES INC
7830 N EVANS RD
SCOTTSDALE, AZ 85260
CONTRACT NUMBER: DAAK70-87-C-0031
DR IAN LEWIN
TITLE:
RESEARCH AND DEVELOPMENT OF SPECIFICATION TECHNIQUES AND
INSTRUMENTATION FOR REALISTIC DECOYS
TOPIC# 136 OFFICE: BRDEC IDENT#: 15118

THE PROJECT WILL EXTEND THE PHASE I EFFORT, WITH THE OBJECTIVE OF PRODUCING A COMPLETE SPECIFICATION SYSTEM FOR DESIGN OF DECOYS AND THEIR QUALITY CONTROL DURING MANUFACTURING. THIS WILL COVER DETAILED THEORETICAL AND MATHEMATICAL INVESTIGATIONS TO DEVELOP ADVANCED ALGORITHMS WHICH PROVIDE A MEASURE OF DECOY REALISM. INSTRUMENTATION WILL BE PRODUCED TO ALLOW COLLECTION OF BIDIRECTIONAL REFLECTANCE DISTRIBUTION DATA ON REAL OBJECTS AND DECOYS, AND FORMS OF DATA REDUCTION WILL BE PROVIDED. EXPERIMENTAL WORK WILL COLLECT SUCH DATA, WHICH THEN WILL BE RELATED TO SUBJECTIVE JUDGEMENTS OF DECOY REALISM. FACTORS CONSIDERED WILL INCLUDE TYPES OF DECOYS, BOTH TWO AND THREE DIMENSIONAL, ANGLES OF INCIDENT LIGHT, BATTLEFIELD ILLUMINATION CONDITIONS AND ENEMY VIEWER GEOMETRIES. TEST EQUIPMENT FACTORS INCLUDE DEVELOPMENT OF A FULLY AUTOMATED GONIOREFLECTOMETER UNDER MICROCOMPUTER CONTROL FOR MEASUREMENT OF SURFACE REFLECTANCE CHARACTERISTICS. EXPERIMENTATION WILL ANALYSE TYPICAL ARMY MATERIALS, AND DEVELOPMENT OF MATHEMATICAL DESCRIPTIONS OF IDEAL DECOYS. THE RESULT WILL BE A SYSTEM WHICH PROVIDES DECOYS WITH ENHANCED REALISM, ALONG WITH A TECHNICAL AND PURCHASING SPECIFICATION FOR THE ARMY.

LIGHTWAVE ELECTRONICS CORP
897-5A INDEPENDENCE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER: DAAA15-87-C-0057
WILLIAM M GROSSMAN
TITLE:
INTERFEROMETRIC HIGH-PRESSURE SENSOR
TOPIC# 74 OFFICE: LABCOM/BRL IDENT#: 16100

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AN OPTICAL PRESSURE MEASUREMENT SYSTEM THAT IS COMPACT, HAS A VERY WIDE PRESSURE RANGE, IS IMMUNE TO ELECTRO-MAGNETIC INTERFERENCE, CAN BE USED IN EXTREME ENVIRONMENTS, HAS A FAST TIME RESPONSE, AND HAS A LOW COST CAN BE BUILT. THE PRESSURE SENSOR IS AN INEXPENSIVE SOLID FABRY-PEROT ETALON. PRESSURE CHANGES ARE DETECTED INTERFEROMETRICALLY THROUGH AN OPTICAL FIBER CONNECTED TO A VERY STABLE SINGLE FREQUENCY LASER SOURCE. WE ARE PROPOSING TO DESIGN, BUILD AND SHIP TO THE ARMY AN OPTICAL INTERFEROMETRIC HIGH PRESSURE MEASURING SYSTEM. THE PRESSURE TRANSDUCER, WHICH WAS CONCEIVED DURING OUR PHASE I EFFORT, IS A BIREFRINGENT ETALON FABRICATED FROM SAPPHIRE. THE BIREFRINGENT ETALON PERMITS THE SIMULTANEOUS MEASUREMENT OF BOTH PRESSURE CHANGES AND PRESSURE CHANGE DIRECTION IN ONE SIMPLE OPTICAL ELEMENT. THE SINGLE FREQUENCY LASER SOURCE IS THE VERY STABLE DIODE-LASER PUMPED MONOLITHIC RING LASER DEVELOPED BY LIGHTWAVE ELECTRONICS FOLLOWING RESEARCH AT STANFORD UNIVERSITY.

MALIBU RESEARCH ASSOCS INC
26670 AGOURA RD
CALABASAS, CA 91302
CONTRACT NUMBER: DAAB07-87-C-P038
DR DANIEL G GONZALEZ
TITLE:
DEVELOPMENT OF A HIGH-SPEED DIELECTRIC EAGLE SCANNER ANTENNA
TOPIC# 297 OFFICE: CECOM/EW IDENT#: 17412

THE DIELECTRIC SCANNER, AS PROPOSED BY MALIBU RESEARCH, IS A TECHNIQUE FOR ACHIEVING MICROWAVE ANTENNA BEAM SCANNING AT RATES COMPETITIVE WITH FAR MORE COSTLY ELECTRONIC SCAN ANTENNAS. ITS FEASIBILITY AND PERFORMANCE WERE ESTABLISHED ON PAPER IN THE PHASE I SBIR EFFORT. (CONTRACT DAAB07-87-C-P038) THE PHASE II PROPOSED PROJECT WILL REDUCE THIS DESIGN TO PRACTICE BY IMPLEMENTATION AND TEST OF SUCH AN ANTENNA FOR AN ARMY APPLICATION OF INTEREST. IF SUCCESSFUL, THIS PROJECT TECHNIQUE COULD DRAMATICALLY CHANGE THE AFFORDABILITY AND APPLICABILITY OF MODERN "PHASED-ARRAY" RADAR SYSTEMS.

MATERIALS ANALYSIS INC
10338 MILLER RD
DALLAS, TX 75238
CONTRACT NUMBER: DAAJ02-87-C-0016
RAYMOND J CLAXTON
TITLE:
REDUCTION OF GEAR WEIGHT
TOPIC# 39 OFFICE: AVSCOM IDENT#: 17286

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TECHNICAL FEASIBILITY OF FABRICATING A LIGHT WEIGHT GEAR COMPONENT BY JOINING A HARDENED STEEL RING TO A LIGHT WEIGHT TITANIUM WEB THROUGH AN ALUMINUM INTERLAYER MATERIAL WAS DEMONSTRATED IN PHASE I. THE PHASE II EFFORT WILL CONCENTRATE ON OPTIMIZING THE TRI-METAL INERTIA WELD JOINT GEOMETRY, SOLVING TEMPERATURE AND STRESS LIMITATIONNS THROUGH ALTERNATE MATERIAL COMBINATIONS, AND RESOLVING WELDMENT CONCENTRICITY CONSTRAINTS WITH A NOVEL APPROACH TO POST WELD HEAT TREATMENT OF THE GEAR TEETH. MANUFACTURING TECHNIQUES AND MATERIAL COMBINATIONS WILL BE DEVELOPED AND EVALUATED ON INEXPENSIVE TEST WELDMENTS BY MATERIALS ANALYSIS, INC., AND INTERFACE WELDING, INC. THE TWO MOST PROMISING CONFIGURATIONS WILL THEN BE EVALUATED ON SMALL TEST GEARS IN A SIMULATED ENGINE/GEARBOX ENVIRONMENT BY ALLISON GAS TURBINE DIVISION OF GENERAL MOTORS, INC., (AGT). FINALLY, THE OPTIMIZED PRODUCTION METHOD WILL BE EMPLOYED TO MANUFACTURE AT LEAST ONE FLIGHT QUALITY GEAR WHICH WILL BE TESTED BY (AGT) UNDER AIRCRAFT SERVICE CONDITIONS.

MENTOR TECHNOLOGIES INC
318 WALL ST - STE 2B
KINGSTON, NY 12401
CONTRACT NUMBER: DAAD07-89-C-0214
DR MITCHELL R BELZER

TITLE:
MICRO-COMPUTER NETWORK ARCHITECTURE FOR RANGE INSTRUMENTATION APPLICATIONS
TOPIC# 209 OFFICE: TECOM/WSMR IDENT#: 39365

VLSI (VERY LARGE SCALE INTEGRATION) TECHNOLOGY HAS BEEN DEVELOPED TO THE POINT WHERE SPECIAL PURPOSE PROCESSORS MAY BE CONCATENATED TO FORM SUPERCOMPUTERS WITH FASTER THROUGHPUT RATES THAN UNIPROCESSOR MACHINES. MTI PROPOSES TO DESIGN AND DEVELOP A MULTIPROCESSOR COMPUTER ARCHITECTURE FOR REAL-TIME DIGITAL FILTERING OF MULTI-SENSOR TRACKING DATA. THE ARCHITECTURE WILL BE OPTIMIZED FOR IMPLEMENTATION OF THE DECENTRALIZED SQUARE ROOT INFORMATION FILTER (DSRIF). PHASE I RESEARCH DEMONSTRATED FEASIBILITY OF THE DSRIF AS A MEANS FOR SOLVING THE LINEAR LEAST SQUARES ESTIMATION PROBLEM IN DECENTRALIZED FORM. PHASE II RESEARCH WILL FOCUS UPON DEVELOPMENT AND TESTING OF A PROTOTYPE DEVICE.

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MICROTRONICS ASSOCS
4516 HENRY ST
PITTSBURGH, PA 15213
CONTRACT NUMBER: DAAL01-87-C-0733
DR DARRYL D COON

TITLE:

THEORETICAL ANALYSIS OF HETEROJUNCTION DOUBLE BARRIER DIODES
FOR LOGIC APPLICATIONS

TOPIC# 128 OFFICE: ETDL IDENT#: 15315

THE PROPOSED RESEARCH INVOLVES A NEW CLASS OF ULTRAFAST SEMICONDUCTOR LOGIC AND MEMORY DEVICES WHOSE OPERATION IS DOMINATED BY QUANTUM MECHANICAL EFFECTS LIKE RESONANT TUNNELING. OUR THEORETICAL ESTIMATES OF SWITCHING SPEEDS OF THE ORDER OF A PICOSECOND HAVE RECENTLY RECEIVED EXPERIMENTAL SUPPORT. THE DEVICES ARE SO FAST THAT LIMITATIONS IMPOSED BY CIRCUITRY MUST BE DEALT WITH IN CONJUNCTION WITH A STUDY OF MEANS OF UTILIZING THE DEVICES. OUR LOGIC AND MEMORY CIRCUIT CONCEPTS DRAW ON EARLY JAPANESE WORK WITH OTHER DEVICES ALTHOUGH SOME OF THE BASIC CONCEPTS APPEAR IN THE WORK OF VON NEUMANN. OUR APPROACH IS TO DEVELOP INTEGRATED CIRCUIT CONCEPTS WHICH CAN BE IMPLEMENTED WITH NEW EPITAXIAL GROWTH TECHNIQUES WHICH ARE THE BASIS FOR HETEROJUNCTION DEVICE FABRICATION. PHASE II WILL ALSO INCLUDE INVESTIGATION OF THE RELATIONSHIP BETWEEN SPEED, SWITCHING THRESHOLDS, AND ENERGY DISSIPATION IN THE DEVICES AND ASSOCIATED CIRCUITRY. A VERY SUBSTANTIAL DEVICE PHYSICS MODELING EFFORT WILL BE AIMED AT RELATING DEVICE CHARACTERISTICS TO DEVICE FABRICATION PARAMETERS SUCH AS MODULATED DOPING PROFILES AND COMPOSITION PROFILES OF EPITAXIAL LAYERS. THIS WILL INCLUDE AN ANALYSIS OF BOTH DIRECT AND EXCHANGE INTERACTIONS BETWEEN ELECTRONS.

MICROTRONICS ASSOCS INC
4516 HENRY ST
PITTSBURGH, PA 15213
CONTRACT NUMBER: DAAB07-87-C-P029
DR DARRYL D COON

TITLE:

QUANTUM WELL IRCM SOURCES

TOPIC# 294 OFFICE: CECOM/EW IDENT#: 17408

SUBMITTED BY

RESEARCH WILL BE CONTINUED ON QUANTUM WELL INFRARED SOURCES EMPLOYING RESONANT TUNNELING AND INTRABAND TRANSITIONS IN THE 3 - 5 MICRON AND 8 - 12 MICRON WAVELENGTH REGIONS. THE DEVICE STRUCTURES UNDER STUDY ARE TRIPLE BARRIER DIODES AND MULTIPLE BARRIER DIODES (SUPERLATTICE STRUCTURES). IN CONTRAST WITH CONVENTIONAL SOLID STATE LASERS AND LIGHT EMITTING DIODES, THESE DEVICES PROVIDE LONGER WAVELENGTH CAPABILITY DUE TO THE USE OF INTRABAND RATHER THAN INTERBAND OPTICAL TRANSITIONS. INTRABAND TRANSITIONS DO NOT IMPOSE A LONG WAVELENGTH CUTOFF AND THEY PERMIT THE USE OF WIDE BANDGAP MATERIALS WITH FEW MATERIALS PROBLEMS. PHASE I WORK HAS LED TO THE DEVELOPMENT OF CONCEPTS WHICH OFFER THE POSSIBILITY OF HIGH POWER OUTPUT AND EFFICIENT CONVERSION OF ELECTRICAL POWER INTO OPTICAL POWER. THESE CONCEPTS INCLUDE THE USE OF STIMULATED EMISSION. THIS WORK WILL BENEFIT FROM THE CONSIDERABLE PROGRESS WHICH HAS BEEN MADE IN THE DEVELOPMENT OF DOUBLE BARRIER DIODES. THE MAIN GOAL OF THE WORK WILL BE TO DETERMINE THE FEASIBILITY OF USING TRIPLE BARRIER DIODES AND SUPERLATTICES AS INFRARED COUNTERMEASURE SOURCES. THE INITIAL EFFORT UNDER PHASE II WILL INVOLVE DEVICE PHYSICS AND NUMERICAL MODELING. PHASE II WILL THEN PROCEED TO THE DESIGN AND SPECIFICATION OF TEST DEVICES. THE PHASE II PLAN INCLUDES SUCCESSIVE ITERATIONS OF EXPERIMENTAL TESTING, COMPARISON WITH MODELS AND OPTIMIZATION.

MICROWAVE MEDICAL SYSTEMS INC (MMS)
52 SOUTH AVENUE - BLDG #7/MS-704
BURLINGTON, MA 01803
CONTRACT NUMBER: DAMD17-87-C7214
RICHARD S GRABOWY
TITLE:
IN-LINE MICROWAVE WARMER FOR BLOOD AND INTRAVENOUS FLUIDS
TOPIC# 284 OFFICE: MEDICAL IDENT#: 17394

THE CONCEPT OF USING A MICROWAVE GENERATOR AND CHAMBER TO UNIFORMLY HEAT BLOOD OR INTRAVENOUS (IV) FLUIDS, IN-LINE, DURING THE INFUSION PROCESS HAS BEEN PROPOSED. AN IN-LINE UNIT OVERCOMES THE DELAY INHERENT WITH REMOTE WARMING AND THE COOLING OCCURRING DURING TRANSPORT OF IV FLUID OR BLOOD HEATED AT A REMOTE LOCATION. THE PHASE I STUDY PROVED THE FEASIBILITY OF USING MICROWAVE ENERGY FOR

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RAPID AND UNIFORM WARMING OF BLOOD AND IV FLUIDS IN A CIRCUIT IN-LINE WITH THE NORMAL INFUSION PATH. IN-VITRO TESTS SHOWED THAT NO SIGNIFICANT CHANGES IN THE CONSTITUENCY OF BLOOD OR FLUIDS WARMED BY THE DEVICE. ALSO DEMONSTRATED, WAS AN INNOVATIVE METHOD OF USING MICROWAVE RADIOMETRY TO NON-INVASIVELY MONITOR THE TEMPERATURE OF THE BLOOD OR FLUIDS IN THE CIRCUIT. THE RESPONSE TIME AND RESOLUTION OF THIS METHOD WAS SHOWN TO BE SUFFICIENT FOR USE IN A FEEDBACK CONTROL MECHANISM WHERE POWER LEVELS ARE REGULATED AS A FUNCTION OF FLUID TEMPERATURE ALONG THE IN-LINE PATHWAY. THE PHASE II PROGRAM WILL COMBINE THE MICROWAVE HEATING TECHNIQUE WITH PASSIVE NON-INVASIVE MICROWAVE RADIOMETRY INTO A SYSTEM CAPABLE OF WARMING BLOOD OR IVE FLUIDS TO A DESIRED CONSTANT TEMPERATURE REGARDLESS OF CHANGES IN FLUID INPUT TEMPERATURES. AN ENGINEERING MODEL WILL BE CONSTRUCTED TO DEMONSTRATE THE FEEDBACK-CONTROL CONCEPT. ITS CONFIGURATION WILL ALLOW THE UNIT TO BE EVENTUALLY PACKAGED FOR PORTABLE OPERATION IN THE FIELD. IN ADDITION, A STERILE, DISPOSABLE "IV-TUBING INSERT" WILL BE DEVELOPED THAT CAN BE SNAPPED IN PLACE FOR SINGLE-USE APPLICATIONS. EFFICACY OF THE SYSTEM WILL BE DETERMINED USING IN-VIVO ANIMAL STUDIES.

MILLIMETER WAVE TECHNOLOGY INC (MWT)
1395 MARIETTA PKWY - BLDG 700
MARIETTA, GA 30067
CONTRACT NUMBER: DAAK60-87-C-0032
RONALD E FORSYTHE
TITLE:
RADAR SIGNATURE REDUCING FABRIC
TOPIC# 179 OFFICE: NATICK IDENT#: 17339

THIS PROGRAM CONCERNS THE DESIGN, DEVELOPMENT, AND TESTING OF THE PERFORMANCE OF A RADAR ABSORBING FABRIC. THE FABRIC UNDER DEVELOPMENT WILL BE FLEXIBLE, BREATHABLE, LIGHTWEIGHT, THIN, SEWABLE AND WASHABLE.

MILLITECH CORP
PO BOX 109 - S DEERFIELD RESEARCH PK
SOUTH DEERFIELD, MA 01373
CONTRACT NUMBER: DAAL01-87-C-0732
DANA E WHEELER
TITLE:
MONOLITHIC CONTROL COMPONENTS FOR MILLIMETER WAVES
TOPIC# 116 OFFICE: ETDL IDENT#: 15251

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IMPROVED CONTROL AND FASTER SWITCHING SPEEDS HAVE BECOME NECESSARY TO ACHIEVE ACCEPTABLE SYSTEM PERFORMANCE OF MILLIMETER WAVE SEEKERS FOR SMART MUNITIONS, AND PHASED ARRAY RADARS. THE OBJECTIVE OF THE PROPOSED STUDY IS TO APPLY MONOLITHIC TECHNIQUES TO SOLVE THE TECHNOLOGICAL PROBLEMS ASSOCIATED WITH DISCRETE CONTROL DEVICES. THE MAJOR GOALS OF THE PROPOSED PROGRAM ARE TO DEVELOP A GaAs MONOLITHIC PIN DIODE ARRAY AND TO INCORPORATE IT INTO A SPST SWITCH. WE ALSO PROPOSE TO DEMONSTRATE THE VERSATILITY AND POWER OF THIS CONCEPT TO INVESTIGATE ITS USE FOR OTHER MILLIMETER WAVE APPLICATIONS.

MILLITECH CORP
PO BOX 109 - S DEERFIELD RESEARCH PK
SOUTH DEERFIELD, MA 01373
CONTRACT NUMBER: DAAH01-87-C-0925
DR PAUL F GOLDSMITH
TITLE:
LOW COST DUAL-POLARIZED MICROWAVE AND MILLIMETER WAVE MONOPULSE ANTENNAS
TOPIC# 149 OFFICE: MICOM IDENT#: 18203

WE PROPOSE TO REFINE AND EXTEND THE TECHNOLOGY DEMONSTRATED IN THE PHASE I EFFORT FOR DUAL POLARIZED MICROWAVE AND MILLIMETER WAVELENGTH MONOPULSE ANTENNAS. THE SEPARATION OF POLARIZATION BY QUASIOPTICAL TECHNIQUES HAS ALLOWED DEVELOPMENT OF A LOW COST, RUGGED MONOPULSE FEED SYSTEM OPERATING AT 35 GHz. IN THIS PHASE II EFFORT WE WILL EXAMINE DIFFERENT MILLIMETER WAVE SUBSTRATE OPTIONS. WE WILL REFINE OUR FEED ARRAY DESIGN, AND OPTIMIZE COUPLING OF THE MONOPULSE PROCESSOR TO THE ANTENNA ARRAY. WE WILL ADAPT EXISTING CIRCUIT DESIGNS AND DEVELOP PLANAR MIXER/RECEIVERS SUITABLE FOR USE IN A 35 GHz SYSTEM. WE WILL DESIGN, FABRICATE, AND THOROUGHLY TEST A COMPLETE DUAL POLARIZED 35 GHz MONOPULSE LENS ANTENNA SYSTEM. WE WILL CARRY OUT IN PARALLEL, EVALUATION OF DESIGN FOR 94 GHz PLANAR MONOPULSE PROCESSOR COMPONENTS AND ARRAY FEED ELEMENTS. WE WILL DEVELOP AND TEST SUCH COMPONENTS AND ALSO PLANAR MIXERS. WE WILL FABRICATE AND TEST A COMPLETE 94 GHz MONOPULSE FEED SYSTEM WITH A LENS ANTENNA AND PERFORM A COMPARISON WITH A WAVEGUIDE PROCESSOR SYSTEM.

MYK TECHNOLOGY INC/AKA CHANG INDUSTRIES
1140-P CENTRE DR
INDUSTRY, CA 91789
CONTRACT NUMBER: DAAL01-87-C-0745
DR YU-WEN CHANG
TITLE:
ADVANCED MILLIMETER HIGH EFFICIENCY GUNN OSCILLATOR SENSOR
TOPIC# 123 OFFICE: ETDL IDENT#: 15299

SUBMITTED BY

MILLIMETER WAVE MISSILE SEEKER 94 GHz HAS BEEN EXAMINED BASED ON SYSTEM REQUIREMENTS. TWO TYPES OF SENSOR FRONTENDS ARE INVESTIGATED: (a) A FIVE-BEAM CONFIGURATION USING THE CENTER BEAM FOR THE TRANSMITTER WITH A 100mW FMCW WAVEFORM GENERATED FROM A PHASE-LOCKED GUNN OSCILLATOR. THE OTHER FOUR BEAMS ARE FOR THE RECEIVERS USING BEAM-LOCK SCHOTTKY MIXERS; (b) A FOUR-BEAM CONFIGURATION WITH EACH BEAM FOR TRANSMITTING-RECEIVING WITH A GUNN OSCILLATOR. THE GUNN OSCILLATOR PERFORMS HOMODYNE DETECTION WITH ITS SELF-OSCILLATING MIXING CHARACTERISTICS. TARGET DISCRIMINATION AGAINST GROUND CLUTTER IS THROUGH A HIGH RANGE RESOLUTION ASSISTED BY THE FOUR-BEAM SUM/DIFFERENCE ANGLE TRACKING TO PROVIDE THE REFERENCE. WAVEFORM IS DESIGNED TO HANDLE DOPPLER. CIRCUIT CONFIGURATIONS ARE PROPOSED.

NATIONAL HYBRID INC
220 SMITHTOWN AVE
RONKONKOMA, NY 11779
CONTRACT NUMBER: DAAD09-87-C-0041
ROY NARDIN
TITLE:
MOBILE RF INTERFEROMETER ANTENNA ARRAY (2.2-2.4 GHz)
TOPIC# 207 OFFICE: TECOM IDENT#: 19043

CURRENT INTERFEROMETER ARRAYS ARE FIXED PLACEMENTS AND LIMITED TO SPECIFIC AREAS OF COVERAGE. WITH A TRADITIONAL APPROACH AN ARRAY OF 30 FEET BY 30 FEET IS NECESSARY TO PROVIDE THE REQUIRED ACCURACY. THIS PROJECT IS TO DEVELOP AN INTERFEROMETER DF ANTENNA ARRAY TO BE OPERATED IN THE BAND OF 2.2 TO 2.4 GHz, HAVE COVERAGE OF 360 DEGREES IN AZIMUTH, 90 DEGREES IN ELEVATION, AND MEET THE MOBILITY REQUIREMENTS. TASKS OF PHASE II ARE: 1. TO DEVELOP THE RF COMPONENTS WHICH ARE OUTLINED IN THE PHASE I STUDY PROGRAM. THESE INCLUDE THE PHASE SHIFTER, COUPLER, APERTURE ANTENNA ELEMENT AND ELECTRONICS INTERFACE. 2. TO DEVELOP AND FABRICATE TWO INTEGRATED INTERFEROMETER DF ANTENNA ARRAYS WHICH ARE SUITABLE FOR TWO DIMENSIONAL COVERAGE. THIS LINEAR ARRAY ANTENNA SHALL HAVE AN ANGULAR RESOLUTION OF FOUR TENTHS OF DEGREE AND BE LESS THAN 5 FEET LONG. 3. TO ANALYZE THE DF RESOLUTION AND ACCURACY FROM THE MEASURED ANTENNA PATTERNS. 4. TO DEMONSTRATE THE FEASIBILITY OF THIS DESIGN AND ITS ADAPTATION IN INTERFEROMETER DF ANTENNA APPLICATIONS.

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ODETICS INC
1515 S MANCHESTER AVE
ANAHEIM, CA 92802
CONTRACT NUMBER: DAAE07-87-C-803
ALAN ROHRABACHER
TITLE:
ROBOTIC TACTICAL RECONNAISSANCE MISSION PACKAGE
TOPIC# 157 OFFICE: TACOM IDENT#: 18432

DETAILED DESIGN, ASSEMBLY AND DELIVERY OF A PARTIALLY SENSORED BUT PROTOTYPICAL REMOTE SURVEILLANCE AND TARGET ACQUISITION (RSTA) MISSION PACKAGE FOR GROUND EMPLACEMENT OR VEHICLE-MOUNTING WILL BE ACCOMPLISHED FOR FIELD TEST AND EVALUATION. IT WILL ALSO SERVE AS A BASIS FOR FUTURE EVOLUTIONARY GROWTH TO A COMPLETE SYSTEM. EMBEDDED IMAGE PROCESSING AND LOW BANDWIDTH DATA COMMUNICATIONS TECHNIQUES WILL PERMIT ALL REQUIRED IMAGE TRANSMISSION AND REMOTE CONTROL VIA STANDARD ARMY TACTICAL RADIOS. A DEMONSTRATION, REMOTE OPERATOR'S STATION AND DATA COMMUNICATION LINK WILL ALSO BE PROVIDED.

ORTEL CORP
2015 W CHESTNUT ST
ALHAMBRA, CA 91803
CONTRACT NUMBER: DAAB07-87-C-F066
JEFFREY E UNGAR
TITLE:
LASER DIODE ARRAY FABRICATION
TOPIC# 315 OFFICE: CECOM/NV IDENT#: 17447

A PROPOSAL FOR THE FABRICATION OF HIGH POWER DIODE LASERS FOR OPTICAL PUMPING APPLICATIONS IS DESCRIBED. THE APPROACH COMBINES MOCVD AND NONABSORBING FACET TECHNOLOGIES FOR HIGH PERFORMANCE AT LOW COST. INNOVATIVE TECHNIQUES FOR NONABSORBING FACET FABRICATION AND HEAT SINKING ARE ALSO SUGGESTED.

PINNACLE RESEARCH INSTITUTE INC
10432 N TANTAU AVE
CUPERTINO, CA 95014
CONTRACT NUMBER:
DR HECTOR SIERRAALCAZAR
TITLE:
MICRO-ELECTROCHEMICAL PROBE WITH SEGMENTED ELECTRODES (MEPSE)
FOR SENSING LOCALIZED CORROSION AND SCALING BY POTABLE WATER
TOPIC# 251 OFFICE: CERL IDENT#: 17110

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A MICRO-ELECTROCHEMICAL PROBE WITH SEGMENTED ELECTRODES (MEPSE) WILL BE DEVELOPED TO MONITOR LOCALIZED CORROSION AND SCALING IN POTABLE WATER DISTRIBUTION LINES. THE MEPSE CONSISTS OF A METALLIC (Cu) TUBE WITH A NUMBER OF FINE WIRES RUNNING ALONG ITS LENGTH AND SUPPORTED VERY CLOSE TO ITS INNER WALLS. THE TUBE, CARRYING THE WATER OR ELECTROLYTE TO BE TESTED IS, ITSELF, SEGMENTED IN RINGS WHICH ARE SEPARATED FROM EACH OTHER BY THIN INSULATORS THAT ALSO SERVE AS SEALS. EACH SEPARATE WIRE AND SEGMENT IS ELECTRICALLY CONNECTED THROUGH A SWITCHING DEVICE TO MEASURING INSTRUMENTS. THE ELECTROCHEMICAL ACTIVITY OF MICRO-AREAS LOCATED AT THE INTERSECTION OF A WIRE-SEGMENT COMBINATION IS THUS SCANNED UNDER COMPUTER CONTROL. IONIC CURRENTS (WITH OR WITHOUT CATHODIC PROTECTION) TO INDIVIDUAL SEGMENTS CAN ALSO BE DETERMINED BY APPROPRIATE SWITCHING. A STATISTICAL APPROACH WILL BE USED FOR EVALUATION OF LOCALIZED VOLTA-METRIC, AMPEROMETRIC AC AND DC TRANSIENT MEASUREMENTS; SCALING CAN BE ASSESSED FROM THROWING POWER AND FROM CAPACITANCE MEASUREMENTS, WHILE LOCALIZED CORROSION CAN BE ASSESSED FROM VOLTAGE GRADIENTS IN THE ELECTROLYTE, OR POLARIZATION RESISTANCE AND TAFEL SLOPES. ABOUT 70% OF WATER UTILITIES IN THE UNITED STATES PROVIDE MODERATELY TO HIGHLY CORROSIVE WATER CAUSING APPROXIMATELY 12 BILLION DOLLARS IN COSTS FROM CORROSION AND SCALING IN PUBLIC AND PRIVATE WATER SYSTEMS. ABOUT 20% OF THIS COST COULD BE SAVED BY IMPLEMENTATION OF CONTROL MEASURING USING MEPSE SENSORS TO MONITOR WATER QUALITY AT CRITICAL POINTS IN THE DISTRIBUTION NETWORKS, AND ULTIMATELY TO APPLY DIRECT FEED BACK TO CONTROL WATER CHEMISTRY. WITH MEPSE'S LINED TO A CENTRAL CPU, THE ARMY OR UTILITIES COULD IMPROVE RELIABILITY AND REDUCE MAINTENANCE COSTS: PROBLEMS CAN BE DETECTED INSTANTLY, BEFORE DAMAGE OCCURS. MEPSE CAN BE EXTENDED TO TEST CORROSION AND SCALING IN COOLING WATER SYSTEMS AND IN ANY SYSTEM INVOLVING ELECTRONICALLY CONDUCTIVE TUBES AND LIQUID ELECTROLYTES IN A RANGE OF PRESSURES AND TEMPERATURES ONLY CONSTRAINED BY SEALING EFFECTIVENESS.

POLYTRONIX INC
805 ALPHA DR
RICHARDSON, TX 75081
CONTRACT NUMBER: DAAL02-87-C-0060
JACOB W LIN

TITLE:

PLASTIC LIQUID CRYSTAL DISPLAY WITH ILLUMINATION SYSTEM FOR
NIGHT USE

TOPIC# 66

OFFICE: HDL/LABCOM

IDENT#: 17313

SUBMITTED BY

THE WORK DESCRIBED REPRESENTS A CONTINUATION OF THE PROMISING EFFORTS IN THE DEVELOPMENT OF AN ALL-PLASTIC LIQUID CRYSTAL DISPLAY FOR NIGHT USE BEGUN IN OUR PHASE I EFFORT. IN PARTICULAR, WE WILL COMPARE AND CONTRAST THE PERFORMANCE OF LCDS MADE FROM DICHROIC AND POLYMER DISPERSED LIQUID CRYSTAL (PDLC) DISPLAYS DURING THE PHASE II EFFORT. THIS COMPARISON WILL INVOLVE A CRITICAL ANALYSIS OF BOTH TYPES OF DISPLAYS IN TERMS OF OVERALL PERFORMANCE READABILITY AND ECONOMICS AND WILL ALSO INCLUDE EXTENSIVE ENVIRONMENTAL TESTING. THESE TESTING PROCEDURES WILL INCLUDE PERFORMANCE AT LOW TEMPERATURES, DURABILITY UNDER HIGH MOISTURE.

POLYTRONIX INC
805 ALPHA DR
RICHARDSON, TX 75081
CONTRACT NUMBER: DAAK60-87-C-0040
JACOB W LIN
TITLE:
BALLISTIC FACE SHIELD WITH DEFOGGING/DEICING CAPABILITY
TOPIC# 175 OFFICE: NATICK IDENT#: 17334

A COMPREHENSIVE APPROACH TO ELIMINATING CONDENSATION ON BALLISTIC FACE SHIELDS IS DESCRIBED IN THIS PROPOSAL. IN PARTICULAR, THE RESEARCH WILL PROVIDE FOR RAPID DEFOGGING AND DEICING CAPABILITY WHEN THESE SHIELDS ARE EMPLOYED IN TEMPERATURE EXTREMES SUCH AS TROPICAL OR ARTIC ATMOSPHERES. THE MULTIFACETED APPROACH WHICH WILL BE EMPLOYED INCLUDES THE APPLICATION OF SPECIAL SURFACE COATINGS TO THE SHIELD AS WELL AS PROVIDING FOR DIRECT ELECTRICAL HEATING TO A LOCALIZED VIEWING AREA. THE SPECIAL COATINGS WILL BE DEPOSITED ON THE FACE SHIELDS USING RF PLASMA POLYMERIZATION.

PREDICTION SYSTEMS INC
200 ATLANTIC AVE
MANASQUAN, NJ 08736
CONTRACT NUMBER: DAAL01-87-C-0737
WILLIAM C CAVE
TITLE:
EXPERT SYSTEM SIMULATOR TO EVALUATE AI TECHNIQUES FOR
COMMUNICATIONS SYSTEM ECCM
TOPIC# 68 OFFICE: VAL/LABCOM IDENT#: 17318

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PSI SUCCESSFULLY DEMONSTRATED HOW MODERN INTERACTIVE GRAPHICS TOOLS COULD BE USED IN AN EXPERT SIMULATION FACILITY TO PROVIDE ESM AND ECCM CAPABILITIES TO SUPPORT ARMY SWITCHED COMMUNICATIONS SYSTEMS. IN PHASE II, PSI PLANS TO EXTEND THE EXPERT SIMULATION FACILITY TO BUILD MORE DETAILED MODELS TO AID THE USER IN ASSESSING THE EFFECTIVENESS OF THE EXPERT SYSTEM FOR IMPROVING COMMUNICATIONS. IN PHASE I, PSI ALSO SHOWED THE FEASIBILITY OF USING OPTIMIZATION TECHNIQUES IN SIMULATIONS TO REDUCE NETWORK VULNERABILITIES. PSI WILL USE THESE EXISTING OPTIMIZATION TECHNIQUES TO EXPEDITE THE PROCESS OF SITING AND REPOSITIONING NODES AND ANTENNAS. GRAPHICS TECHNIQUES WILL BE PROVIDED TO PROVIDE A VISUAL AUDIT TRAIL OF IMPROVEMENTS LEADING TO AN OPTIMAL SOLUTION. PSI WILL ALSO UPGRADE AND TEST THE FAST LINE-OF-SIGHT (LOS) ALGORITHMS TO IMPROVE THE RUN-TIME SPEED OF THE LOS SYSTEM. ADDITIONAL ENHANCEMENTS WILL BE ASSESSED AS PART OF THE EFFORT TO IMPROVE CALCULATION SPEED. THE FINAL EFFORT IN PHASE II WILL BE TO PROVIDE SIMULATION TOOLS THAT PREDICT WITH REASONABLE ACCURACY THE PERFORMANCE OF ADAPTIVE ANTENNAS UNDER REALISTIC CONDITIONS OF CIRCUIT IMPLEMENTATION, OPERATIONAL ENVIRONMENT, AND THE CONTROLLABLE VARIATIONS THAT CAN BE ENCOUNTERED.

PREDICTION SYSTEMS INC (PSI)
200 ATLANTIC AVE
MANASQUAN, NJ 08736
CONTRACT NUMBER: DAAB07-87-C-A031
ROBERT E WASSMER

TITLE:

ADVANCED FACILITIES TO EXPEDITE DESIGN AND EVALUATION OF
PACKET SWITCHED SYSTEMS

TOPIC# 302 OFFICE: CECOM/CA IDENT#: 17423

HAVING SUCCESSFULLY DEMONSTRATED THE FEASIBILITY OF USING MODERN SIMULATION TECHNIQUES TO SIMULATE A BASELINE PACKET SWITCH SYSTEM VIA AN EXPERT SYSTEM APPROACH, PSI WILL NOW USE THIS BASELINE SYSTEM TO IMPLEMENT THE PACKET SWITCH OPTION OF MSE IN GSS. IN THIS PHASE II PROGRAM, THE PHASE I BASELINE PACKET SWITCH MODELS RUNNING UNDER THE GENERAL SIMULATION SYSTEM (GSS) WILL BE USED TO IMPLEMENT THE MSE PACKET SWITCH OPTION, AND WILL BE INCORPORATED WITH EXISTING GSS MODELS OF MSE AND EVALUATE FOR ACCEPTANCE TO INSURE THAT THE SYSTEM

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WILL FULLY SUPPORT USER EXPECTATIONS. THE SIMULATION WILL BE BENEFICIAL IN RESOLVING POSSIBLE CAUSES OF CONFLICT AS WELL AS FINDING SOLUTIONS TO PROBLEMS. EVALUATION CONSIDERATIONS WILL INCLUDE, BUT NOT BE LIMITED TO, RESPONSE DELAY AND THROUGHPUT. THE COMBINED MSE SIMULATION WILL BE IMPLEMENTED WITH THE REAL-TIME AND MULTIPROCESSOR SUBSYSTEMS OF GSS, WHOSE CAPABILITIES WERE DEMONSTRATED IN PHASE I. THIS WILL ALLOW FOR RUNNING THE MSE MODEL AND THE PACKET SWITCH OPTION TO MSE IN AN ENVIRONMENT THAT CAN SUPPORT FUTURE GROWTH OF THESE MODELS AND SIGNIFICANT ADVANCEMENTS IN COMMUNICATIONS TECHNOLOGY.

Q-DOT INC
1069 ELKTON DR
COLORADO SPRINGS, CO 80907
CONTRACT NUMBER: DAAA15-87-C-0037
DAVID W GARDNER
TITLE:
A MULTIPLE-OUTPUT Si/GaAs HYBRID IMAGING DEVICE FOR VERY
HIGH FRAME-RATE APPLICATIONS
TOPIC# 96 OFFICE: BRL IDENT#: 17039

CONVENTIONAL HIGH-SPEED IMAGE-RECORDING SYSTEMS ARE TYPICALLY BASED ON STROBOSCOPIC AND/OR HIGH-SPEED FILM METHODOLOGIES. THESE APPROACHES SUFFER FROM THE USE OF FILM AS A RECORDING MEDIUM, REDUCING SYSTEM FLEXIBILITY AND ELIMINATING REAL-TIME EVALUATION OF IMAGE DATA. FURTHERMORE, CONVENTIONAL ELECTRONIC IMAGING SYSTEMS DO NOT POSSESS HIGH FRAME-RATE CAPABILITIES. Q-DOT PROPOSES A HYBRID Si/GaAs ELECTRONIC IMAGING DEVICE CAPABLE OF OBTAINING MORE THAN 3000 IMAGES PER SECOND. THE DEVICE CONSISTS OF A SILICON PERISTALTIC CHARGE-COUPLED DEVICE IMAGING ARRAY WITH GaAs AMPLIFIERS BUMP MOUNTED FOR USE AS OUTPUT STRUCTURES. THE PROPOSED IMAGER HAS INHERENT OPTICAL SHUTTERING AND UTILIZES A PARALLEL OUTPUT DATA ARRANGEMENT. FOR AN ARRAY FORMAT OF 512 X 512 PIXELS WITH EIGHT PARALLEL OUTPUT CHANNELS, THE PROPOSED IMAGER CAN GATHER AND OUTPUT MORE THAN 3000 PER SECOND AT 100 MEGAPIXEL/SECOND/CHANNEL OUTPUT RATE, WITH A DYNAMIC RANGE OF GREATER THAN 1000 TO 1. SUBSTANTIALLY HIGHER FRAME RATES ARE POSSIBLE THROUGH THE USE OF ADDITIONAL OUTPUT CHANNELS AND HIGHER OUTPUT DATA RATES.

QUANTEX CORP
2 RESEARCH CT
ROCKVILLE, MD 20850
CONTRACT NUMBER: DAAB07-87-C-F099
CHARLES Y WRIGLEY
TITLE:
FLIR ARRAY ALTERNATIVE
TOPIC# 311 OFFICE: BRL/LABCOM IDENT#: 17437

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THE QUANTEX CORPORATION PROPOSES AN EIGHTEEN MONTH PHASE II PROGRAM TO DEMONSTRATE TECHNICAL FEASIBILITY WITH TEN DELIVERABLE PROTOTYPE DEVICES OF USEFUL UPCONVERSION OF INFRARED IMAGES TO VISIBLE-LIGHT IMAGES. THE PHASE I EFFORT SHOWED THAT QUANTEX ELECTRON-TRAPPING (ET) MATERIALS CAN CONVERT 3-5 AND 8-12 MICRON INFRARED INPUTS TO VISIBLE-WAVELENGTH OPTICAL OUTPUTS. THIS PROPOSAL ADDRESSES MATERIALS R&D EXTENSION WITH EMPHASIS ON THE 3-5 MICRON BAND, FOCAL PLANE FILM DEVELOPMENT, AND PROTOTYPE DEVICE GENERATION.

QUANTIC INDUSTRIES INC
990 COMMERCIAL ST
SAN CARLOS, CA 94070
CONTRACT NUMBER: DAAL02-87-C-0058
WILLIAM MARSHALL
TITLE:
LOW-COST MINIATURE DC-DC CONVERTER FOR EFI S&A
TOPIC# 61 OFFICE: HDL/LABCOM IDENT#: 17307

THE PROPOSED EFFORT WILL UTILIZE THE DC-DC CONVERTER DESIGN DEVELOPED DURING PHASE I AS THE BASIS FOR DEVELOPING AN ELECTRONIC SAFETY AND ARMING (S&A) DEVICE FOR MISSILES AND SMART MUNITIONS. THIS S&A WILL INCORPORATE PRIOR SBIR RESEARCH ON CAPACITORS, DC-DC CONVERTERS, AND BOMB FUZES TO PROVIDE A GENERIC ARMY S&A THAT CAN BE QUICKLY AND INEXPENSIVELY ADAPTED TO NEW DEVELOPMENT PROGRAMS OF P(3)I FOR EXISTING SYSTEMS. THE S&A WILL HAVE NO MOVING PARTS, WILL HAVE AN ENTIRELY SOLID-STATE ELECTRONIC DESIGN, AND WILL FULLY COMPLY WITH THE NEW MIL-STD-1316C WAIVER LANGUAGE.

RUPPRECHT & PATASHNICK CO INC
8 CORPORATE CIR
ALBANY, NY 12203
CONTRACT NUMBER: DAAD05-87-C-0024
HARVEY PATASCHNICK
TITLE:
A PORTABLE TEOM PARTICULATE MASS MONITOR FOR FIELD APPLICATION
TOPIC# 188 OFFICE: TECOM IDENT#: 17350

SUBMITTED BY

THE ACCURATE MEASUREMENT IN REAL-TIME OF PARTICULATE CONCENTRATIONS IN AIR UNDER FIELD CONDITIONS REPRESENTS A SIGNIFICANT TECHNOLOGICAL CHALLENGE. FILTER-BASED MASS MEASUREMENT REPRESENTS THE STANDARD FOR PARTICULATE MEASUREMENTS, BUT ALL REAL-TIME INSTRUMENTS EMPLOY TECHNIQUES WHICH DO NOT ALWAYS RELATE WELL TO FILTER-BASED MEASUREMENTS - ALL INSTRUMENTS EXCEPT ONE. THE TAPERED ELEMENT OSCILLATING MICROBALANCE, PRODUCED BY RUPPRECHT & PATASHNICK CO., INC. UNDER THE TRADE NAME TEOM(R), IS A DEVICE WHICH DETERMINES THE MASS OF PARTICULATES BY AN INERTIAL MASS MEASUREMENT TECHNIQUE IN REAL TIME AS THEY DEPOSIT ON A FILTER CARTRIDGE. THE OBJECT OF THIS PROJECT IS THE DEVELOPMENT OF A TEOM(R)-BASED PORTABLE INSTRUMENT CAPABLE OF REAL-TIME PARTICULATE MEASUREMENTS UNDER FIELD CONDITIONS. UNDER PHASE I, A DESIGN FOR THIS PROPOSED INSTRUMENT HAS BEEN DEVELOPED. THE SYSTEM HAS BEEN DESIGNED WITH A BUILT-IN CUP WHICH ALLOWS FOR A HIGH DEGREE OF EXPERIMENTAL AND DATA ACQUISITION FLEXIBILITY, AND IT CAN OPERATE IN THE FIELD IN A PREPROGRAMMED MODE OR REMOTELY THROUGH A COMMUNICATIONS LINK. UNDER PHASE II, A PROTOTYPE WILL BE FABRICATED AND TESTED, LEADING TO THE PRODUCTION OF A SERIES OF INSTRUMENTS WHICH WILL BE UTILIZED IN A FIELD NETWORK SITUATION.

SABBAGH ASSOCS INC
4639 MORNINGSID DR
BLOOMINGTON, IN 47401
CONTRACT NUMBER: DAAL02-87-C-0101
HAROLD A SABBAGH
TITLE:
TRANSIENT ELECTROMAGNETIC FIELD COUPLING TO A METALLIC
ENCLOSURE USING N-PORT THEORY
TOPIC# 45 OFFICE: HDL/LABCOM IDENT#: 17343

WE DEVELOP A COMPUTATIONALLY FEASIBLE MODEL FOR TRANSIENT ELECTROMAGNETIC FIELD COUPLING INTO A METALLIC ENCLOSURE. THE MODEL IS BASED ON A FINITE ELEMENT TECHNIQUE THAT USES THE GALERKIN VARIANT OF THE METHOD OF MOMENTS. METHODS OF DYNAMIC ANALYSIS, INCLUDING EXPLICIT AND IMPLICIT TIME INTEGRATORS, AS WELL AS NORMAL MODES, ARE CONSIDERED, AND AN ALGORITHM FOR COMPUTING THE COUPLING TO THE EXTERIOR REGION, DIRECTLY IN THE TIME DOMAIN, IS PRESENTED. THE EXTERIOR COUPLING ALGORITHM IS BASED ON AN ELECTROMAGNETIC BOUNDARY-

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INTEGRAL RELATION, TOGETHER WITH N-PORT THEORY.

SCHWARTZ ELECTRO-OPTICS INC
45 WINTHROP ST
CONCORD, MA 01742
CONTRACT NUMBER: DAAB07-87-C-F086
DR PETER F MOULTON
TITLE:
EFFICIENT 4-MICRON GENERATION
TOPIC# 314 OFFICE: NV IDENT#: 17445

THE AIM OF THE PROPOSED PHASE II PROGRAM IS TO DEMONSTRATE RELIABLE, HIGH-ENERGY GENERATION OF PULSED RADIATION IN THE 3.8-4.2-MICRON WAVELENGTH REGION THROUGH THE USE OF A CdSe OPTICAL PARAMETRIC OSCILLATOR PUMPED BY A 2.79-MICRON, Q-SWITCHED, Er, Cr:YSGG LASER. THE SYSTEM PERFORMANCE GOALS ARE AN OVERALL (FLASHLAMP-PUMPED) EFFICIENCY OF 0.5%, AN OUTPUT ENERGY OF 100 mJ AND A PULSE RATE OF 10 Hz. A MAJOR ELEMENT OF THE PROGRAM IS THE DEVELOPMENT OF CdSe GROWTH TECHNOLOGY TO SUPPLY LARGE, LOW-LOSS AND UNIFORM CRYSTALS. AS PART OF THE EFFORT, A STUDY WILL BE CONDUCTED ON THE FEASIBILITY OF REACHING A SYSTEM EFFICIENCY OF 1% BY THE USE OF DIODE-LASER-PUMPED Er LASER. FOR COMPLETENESS, THE USE OF OTHER NONLINEAR CRYSTALS AS A SUBSTITUTE FOR CdSe WILL BE CONSIDERED.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
CONTRACT NUMBER: DAAL01-87-C-0740
M MEYYAPPAN
TITLE:
PROCESS MODELING OF MAGNETRON REACTIVE ION ETCHING (MIE) -
APPLICATIONS TO GaAs AND AlGaAs
TOPIC# 126 OFFICE: ETDL IDENT#: 15310

THIS DOCUMENT DESCRIBES A PROGRAM TO STUDY, THROUGH A COMPREHENSIVE PROCESS MODELING EFFORT, THE MAGNETRON REACTIVE ION ETCHING PROCESS WITH APPLICATIONS TO III-V TECHNOLOGY. AN EXPERIMENTAL COMPONENT

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IS INCLUDED IN THE PROGRAM TO ASCERTAIN PLASMA DISSOCIATION AND SURFACE REACTION MECHANISMS ALONG WITH THE ASSOCIATED RATE CONSTANTS FOR AT LEAST ONE ETCH GAS SYSTEM. THE PROCESS MODEL INVOLVES OBTAINING NUMERICAL SOLUTIONS TO THE EQUATIONS GOVERNING THE DYNAMICS OF THE NEUTRAL AND CHARGED PARTICLES AND WILL INCLUDE A PARAMETRIC STUDY TO OBTAIN ETCH RATE AND UNIFORMITY AS A FUNCTION OF SYSTEM PARAMETERS SUCH AS PRESSURE, FLOW RATE.

SCIENTIFIC TECHNOLOGY INC
2 RESEARCH PL
ROCKVILLE, MD 20850
CONTRACT NUMBER: DAAD05-87-C-0026
TING-I WANG
TITLE:
A LONG RANGE OPTICAL SCINTILLOMETER FOR ATMOSPHERIC
REFRACTIVE TURBULENCE
TOPIC# 190 OFFICE: TECOM IDENT#: 15223

SATURATION EFFECT LIMITS THE PRESENT OPTICAL SCINTILLOMETER TO MEASURE PATH PROFILE OF THE ATMOSPHERIC REFRACTIVE TURBULENCE TO 1 KM OR LESS. THE PROPOSED TECHNOLOGY MAKES THE SCINTILLOMETER OPERATING EVEN IN THE SATURATION REGIME. PHASE I RESULTS INDICATE THAT A SECOND GENERATION OPTICAL SCINTILLOMETER WOULD MEASURE ATMOSPHERIC TURBULENCE INTENSITY TO 2.5 KM WITHOUT USING LARGER TRANSMITTING OR RECEIVING APERTURES. THE USE OF SPATIALLY FILTERED TRANSMITTER AND RECEIVER TO PROFILE THE TURBULENCE ALONG THE PATH WAS INVESTIGATED. PHASE I STUDY GAVE PROMISING RESULTS FOR A PROFILING SYSTEM. DETAILED STUDIES AND THE DESIGN OF A PROFILER WILL BE CARRIED OUT IN THE PROPOSED PHASE II EFFORTS. THE INSTRUMENT WILL PROVIDE REAL-TIME CONTINUOUS MEASUREMENTS OF TURBULENCE INTENSITY PROFILES IN THE FIELD OPERATION. THE INSTRUMENT IS INSENSITIVE TO ENVIRONMENTAL ACOUSTIC AND ELECTROMAGNETIC NOISE. IT IS COMPACT FOR EASY TRANSPORT AND OPERATION.

SEPARATION SYSTEMS TECHNOLOGY
4901 MORENA BLVD
SAN DIEGO, CA 92117
CONTRACT NUMBER: DAAK76-87-C-0065
CLYDE E MILSTEAD
TITLE:
DEVELOPMENT OF AN IMPROVED CLEANING SOLUTION FOR ROWPU UNITS
TOPIC# 140 OFFICE: BRDEC-PVD IDENT#: 15165

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THIS PROGRAM IS DIRECTED TOWARD THE DEVELOPMENT OF A LOW COST, PREPACKAGED, CLEANING SOLUTION FORMULATION FOR USE ON ROWPU ELEMENTS. CURRENT METHODS OF CLEANING HAVE GENERALLY BEEN INEFFECTIVE, RESULTING IN A LARGE ELEMENT REPLACEMENT COST TO THE MILITARY. THE PHASE I PROGRAM HAS IDENTIFIED THE NATURE OF FOULANTS MOST COMMONLY OBSERVED BY ARMY AND MARINE CORPS ROWPU UNITS AND, BASED ON THE CHEMISTRY AND PROPERTIES OF THE MEMBRANE ELEMENTS, THE REQUIREMENTS FOR A BUFFERED CLEANING SOLUTION FORMULATION HAVE BEEN ESTABLISHED. FACILITIES AT FORT BELVOIR, VA AND THE NAVAL CIVIL ENGINEERING LABORATORY AT PORT HUENEME, CA WILL BE UTILIZED FOR FIELD TESTING OF VARIOUS CLEANING SOLUTION FORMULATIONS ON ELEMENTS FOULED DURING OPERATION ON BOTH SURFACE WATERS AND SEAWATER.

SHENANDOAH SYSTEMS CO INC
512 HERNDON PKWY - STE D
HERNDON, VA 22070

CONTRACT NUMBER: DACA39-87-C-0031

JAMES M GLYNN

TITLE:

SATELLITE REPORTING LASER TIDE GAUGE DEVELOPMENT PROGRAM

TOPIC# 266 OFFICE: WES/CORPS IDENT#: 16999

THE APPLICATION OF LASER RANGEFINDING TECHNOLOGY TO A SATELLITE REPORTING TIDE GAUGE IS PROPOSED. THIS EFFORT BUILDS ON PRIOR EFFORTS, WHERE THE EFFECTIVENESS OF THE LASER RANGING TECHNOLOGY FOR WATER LEVEL MONITORING HAS BEEN DEMONSTRATED. IT IS ALSO PROPOSED THAT THE SENSOR BE MODIFIED TO INCORPORATE WAVE MONITORING, A CAPABILITY THAT WAS ALSO DEMONSTRATED IN PRIOR EFFORTS. THIS EFFORT REQUIRES THE INTEGRATION OF SOLAR POWER SYSTEMS, BATTERY SYSTEMS, LASERS, AND SATELLITE COMMUNICATIONS. WITH THE INTEGRATION OF THESE TECHNOLOGIES, A REMOTE SATELLITE REPORTING TIDE GAUGE CAN BE DEVELOPED, FOR LONG PERIODS OF UNATTENDED OPERATION.

SIGMA RESEARCH CORP
234 LITTLETON RD - #2E
WESTFORD, MA 01886

CONTRACT NUMBER: DAAD05-87-C-0028

STEVEN R HANNA

TITLE:

METEOROLOGICAL INFLUENCES ON SMOKE/OBSCURANT EFFECTIVENESS

TOPIC# 189 OFFICE: TECOM IDENT#: 17351

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THE SIX-MONTH STUDY CONDUCTED AS PHASE I OF THIS RESEARCH PROJECT PRODUCED A SET OF CONCLUSIONS AND RECOMMENDATIONS CONCERNING THE FEASIBILITY OF DEVELOPING A FRAMEWORK TO EVALUATE THE METEOROLOGICAL INFLUENCES ON SMOKE/OBSCURANT EFFECTIVENESS. THE WORK TASKS PROPOSED UNDER PHASE II REPRESENT AN EXPANDED SCOPE OF WORK NECESSARY TO FULLY DEVELOP, IMPLEMENT, AND TEST PROCEDURES FOR ACCOUNTING FOR METEOROLOGICAL INFLUENCES, INCLUDING THE UNCERTAINTY IN USING MEAN MEASUREMENTS OF SOURCE CONDITIONS AND METEOROLOGICAL VARIABLES. A TWO YEAR STUDY WITH A TOTAL LEVEL OF EFFORT OF 2.6 MAN YEARS IS PROPOSED FOR PHASE II, WHICH WILL INCLUDE THE FOLLOWING NINE TASKS: PHASE II TASK 1: ARCHIVAL OF DATA SETS AND PREPARATION OF MODELERS' DATA BASES. PHASE II TASK 2: IMPLEMENTATION OF MODELS FOR SCALING CONCENTRATIONS, INCLUDING SOURCE MODELS. PHASE II TASK 3: APPLICATION OF MODELS TO TEST DATA SETS, TO PRODUCE SETS OF MODEL PREDICTIONS. PHASE II TASK 4: REFINEMENT AND FURTHER DEVELOPMENT OF METEOROLOGICAL ASSESSMENT SOFTWARE. PHASE II TASK 5: ASSESSMENT OF DATA UNCERTAINTIES. PHASE II TASK 6: ASSESSMENT OF STOCHASTIC UNCERTAINTIES. PHASE II TASK 7: ASSESSMENT OF PHYSICS ERRORS. PHASE II TASK 8: APPLICATION OF METEOROLOGICAL ASSESSMENT SOFTWARE. PHASE II TASK 9: PREPARE USER'S GUIDE FOR METEOROLOGICAL ASSESSMENT SOFTWARE.

SOFTWARE PRODUCTIVITY SOLUTIONS INC
PO BOX 361697
MELBOURNE, FL 32916
CONTRACT NUMBER: DAAB07-87-C-A042
DR J KAYE GRAU
TITLE:
AUTOMATED REUSABLE COMPONENT SYSTEM (ARCS)
TOPIC# 299 OFFICE: CECOM IDENT#: 17415

THE OVERALL OBJECTIVE OF THE AUTOMATED REUSABLE COMPONENT SYSTEM (ARCS) EFFORT IS TO ADDRESS CRITICAL ISSUES IN REUSABLE SOFTWARE TECHNOLOGY AND TO DEVELOP AUTOMATED TOOLS TO SUPPORT THE REUSE OF COMPONENTS IMPLEMENTED IN THE ADA PROGRAMMING LANGUAGE. FOR PHASE II, SOFTWARE PRODUCTIVITY SOLUTIONS, INC. PROPOSES AN INNOVATIVE YET PRAGMATIC APPROACH TO DEVELOP A PRODUCTION-QUALITY VERSION OF THE ARCS. THE RESULTANT ARC PRODUCT WILL SUPPORT FIVE UNIQUE USER

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ROLES WITH OPERATIONAL CAPABILITIES FOR: BROWSING THROUGH THE COMPONENTS AND CLASSIFICATION INFORMATION IN A LIBRARY; DETERMINING COMPONENT CHARACTERISTICS, CLASSIFYING AND INSERTING THEM INTO A LIBRARY EVALUATING AND MEASURING COMPONENT CHARACTERISTICS AND THE RESULTS OF QUERIES; EXTRACTING AND CONFIGURING COMPONENTS FOR USE IN AN ADA APPLICATION SYSTEM WITH DOD-STD-2167A DOCUMENTATION REQUIREMENTS; CREATING AND MAINTAINING MULTIPLE COMPONENT CLASSIFICATION SCHEMES; CONFIGURING, MANAGING AND TUNING THE LIBRARY SYSTEM. SPS WILL REFINE AND ENHANCE FEATURES PROTOTYPED UNDER THE SUCCESSFUL PHASE I EFFORT, INCLUDING INTEGRATING DATABASE, INFORMATION AND EXPERT SYSTEM TECHNOLOGY UNDER AN "EXTENDED ER" MODEL, PROVIDING A COMPREHENSIVE SET OF COMPONENT CHARACTERISTICS, SUPPORT COMPONENT VARIANTS AND HIERARCHIES, AND SUPPORT FIVE CATEGORIES OF ADA IMPLEMENTATIONS OF COMPONENTS AND ASSOCIATED TESTS. THE DEVELOPMENT WILL BE ACCOMPLISHED IN TWO BUILDS OVER TWO YEARS. TRADE-OFF STUDIES INFO SELECTED REUSE AUTOMATION ISSUES WILL SUPPLEMENT THE DEVELOPMENT.

SOFTWARE PRODUCTIVITY SOLUTIONS INC
PO BOX 361697
MELBOURNE, FL 32936
CONTRACT NUMBER:
DR J KAYE GRAU
TITLE:
EXPERT SYSTEM FOR SOFTWARE DESIGN ANALYSIS (ESSDA)
TOPIC# 304 OFFICE: AMSEL/PA IDENT#: 20074

THE PROPOSED EFFORT IS FOR AN EXPERT SYSTEM FOR SOFTWARE DESIGN ANALYSIS (ESSDA) TOOLSET THAT USES ADVANCED SOFTWARE METRICS FOR QUANTITATIVE MEASURES OF THE QUALITY OF SOFTWARE DESIGN AND INTEGRATES KNOWLEDGE-BASED TECHNOLOGIES TO SUPPORT THE MORE QUALITATIVE ASPECTS OF SOFTWARE DESIGN ANALYSIS. THE ESSDA TOOLSET WILL FOCUS THE ATTENTION OF THE PRODUCT ASSURANCE PERSONNEL TO POTENTIAL TROUBLE SPOTS EARLY IN THE LIFE CYCLE (BY INTERPRETING SYMPTOMS) IN ORDER TO IMPROVE PRODUCT QUALITY. THE EMPHASIS WILL BE ON APPLYING AND INTERPRETING ADVANCED METRICS TECHNOLOGIES TO PREVENT ERRORS, RATHER THAN MERELY MEASURING THEIR EFFECT AFTER THE FACT. ANALYSIS OF BOTH PRELIMINARY AND DETAILED DESIGN IS SUPPORTED. BY ENHANCING THE CAPABILITIES OF PRODUCT ASSURANCE PERSONNEL, ESSDA WILL INCREASE THE PRODUCTIVITY AND EFFECTIVENESS OF ARMY PRODUCT

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ASSURANCE ACTIVITIES.

SOUTHWEST SCIENCES INC
1570 PACHECO ST - STE E-11
SANTA FE, NM 87501
CONTRACT NUMBER: DACA33-87-C-0028
DR ALAN C STANTON
TITLE:
A DIODE LASER HUMIDITY SENSOR FOR COLD ENVIRONMENTS
TOPIC# 261 OFFICE: CRREL IDENT#: 17348

MEASUREMENTS OF ATMOSPHERIC HUMIDITY IN COLD REGIONS OR WINTER FIELD ENVIRONMENTS ARE DIFFICULT USING EXISTING METEOROLOGICAL INSTRUMENTATION. IN GENERAL, PRESENT FIELD INSTRUMENTS FOR UNTENDED HUMIDITY MEASUREMENTS ARE PLAGUED BY LOW SENSITIVITY AND CALIBRATION DRIFTS, RESULTING IN POOR ACCURACY AND LOW RELIABILITY. THE PURPOSE OF THIS STUDY IS TO DEVELOP A NEW CONCEPT FOR HUMIDITY MEASUREMENT, BASED ON ABSORPTION OF NEAR-INFRARED RADIATION FROM LOW-COST, COMMERCIAL InGaAsP LASER DIODES. THE RESULTS OF PHASE I RESEARCH SHOW THAT THE CONCEPT EXCEEDS PROGRAM REQUIREMENTS FOR SENSITIVITY, ACCURACY, AND TIME RESPONSE. BY OPTIMIZATION OF THE INSTRUMENT DESIGN, REAL-TIME MEASUREMENT OF HUMIDITY WILL BETTER THAN 1% ACCURACY AT ALL COLD REGION TEMPERATURES OF INTEREST CAN BE ACHIEVED. IN PHASE II, PROTOTYPE INSTRUMENTATION BASED ON THE DIODE LASER APPROACH WILL BE ASSEMBLED AND TESTED. FIBER OPTICS WILL BE USED TO COUPLE THE LASER RADIATION INTO AND OUT OF AN AMBIENT PRESSURE ABSORPTION CELL, FACILITATING REMOTE PLACEMENT OF THE SENSOR. FOLLOWING LABORATORY CALIBRATION AND EVALUATION, THE PROTOTYPE INSTRUMENT WILL BE TESTED UNDER WINTER OR COLD REGION FIELD CONDITIONS.

SPACE TECH CORP
125 CRESTRIDGE DR
FORT COLLINS, CO 80525
CONTRACT NUMBER: DAAD09-87-C-0102
DR MICHAEL ANDREWS
TITLE:
REAL-TIME SIGNAL PROCESSING SYSTEMS
TOPIC# 212 OFFICE: TECOM IDENT#: 19045

SUBMITTED BY

SIGNAL PROCESSING ALGORITHMS ARE MULTIPLY/ACCUMULATE INTENSIVE. NOVEL METHODS USING ADVANCED IC DEVICES ARE NEEDED. RADAR DIGITAL SIGNAL PROCESSING AND SPREAD SPECTRUM PROCESSING TASKS INCLUDE FFT, LMMS, LS, CONVOLUTION, CORRELATION, AND SPECTRUM ANALYSIS. AS EXAMPLES, 32 X 32 MULTIPLIER, 64 X 64 MULTIPLIER, PARALLEL MULTIPLIER AND FLOATING-POINT PROCESSING ARCHITECTURES ARE SOUGHT FOR PROCESSING SPEEDS AT 10 NANOSECOND. MICROPROGRAMMABLE DESIGNS ARE TO BE DEVELOPED FOR REPROGRAMMABLE HIGH SPEED ARCHITECTURE. BROAD LEVEL DEVELOPMENT IS PROPOSED TO DESIGN, INTEGRATE, AND DEVELOP SPECIALIZED HIGH SPEED CASCADABLE SIGNAL PROCESSING CIRCUITS TO PROCESS RANGE AND RANGE RATE DATA, DIGITAL FOCUS, REAL-TIME KALMAN FILTERING, REAL-TIME TARGET MOTION RESOLUTION (TMR) PROCESSING OF MPS-36 AND FPS-16 RADARS DATA, AND PROCESSING IMAGE/PATTERN INFORMATION FOR REAL-TIME OPTICAL TRACKERS OF MULTI-MUNITIONS SCENES.

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILL, CA 92653
CONTRACT NUMBER: DAAB07-87-C-P045
OLIVER CATHEY
TITLE:
INTEGRATED AIRCRAFT SURVIVABILITY EQUIPMENT EFFECTIVELY MODEL
TOPIC# 292 OFFICE: CECOM/EW IDENT#: 17404

SPARTA PROPOSES TO EXPAND THE AIR DEFENSE EFFECTIVENESS MODEL (ADEM) CODE, WHICH WAS INSTALLED ON THE CECOM VAX COMPUTER DURING PHASE I, TO INCORPORATE AIR-TO-AIR THREATS AND REMAINING UNMODELED OV-1D AIRCRAFT ASE, TO COMPLETE ADEM DOCUMENTATION, TO TRAIN CECOM USERS, AND TO ASSIST CECOM USERS IN THE EVALUATION OF THE REMAINING OV-1D BLOCK IMPROVEMENT PROGRAM ALGORITHMS NOT STUDIED IN PHASE I (ALGORITHMS 2 THROUGH 21).

STAR MICROWAVE
546 DIVISION ST
CAMPBELL, CA 9508
CONTRACT NUMBER: DAAL01-87-C-00734
ROBERT M PHILLIPS
TITLE:
LOW COST RF INTERACTION CIRCUITS FOR HIGH POWER TWTS
TOPIC# 132 OFFICE: ETDL IDENT#: 15327

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THE ARMY HAS AN ONGOING NEED FOR HIGH POWER TRAVELING WAVE TUBES IN THREE FREQUENCY BANDS; X, C, AND S. THESE ARE CURRENTLY FILLED BY TUBES WHICH USE THE COSTLY COUPLED CAVITY RF INTERACTION CIRCUIT. RECENT ADVANCES IN HELIX TWT FABRICATION TECHNOLOGY MAKE THE FAR LESS COSTLY CONNECTED RING RF CIRCUIT A STRONG CANDIDATE TO REPLACE THE COUPLED CAVITY CIRCUIT. PHASE I WAS DEVOTED TO A COLD TEST, ANALYTICAL AND COMPUTER STUDY OF PROMISING CONNECTED RING CIRCUITS. ONE CIRCUIT EMERGED AS THE BEST CANDIDATE TO SATISFY MOST OR ALL OF THE ARMY'S REQUIREMENTS; THE SLANT RING CIRCUIT WITH ALL BRAZED BEO DIELECTRIC SUPPORT. A PAPER DESIGN WAS CREATED FROM THE COLD TEST RESULTS AND WAS COMPUTER-VALIDATED FOR ELECTRICAL AND THERMAL COMPATIBILITY WITH THE ARMY REQUIREMENTS. PHASE II WILL BE DEVOTED TO THE DESIGN, FABRICATION AND VALIDATION TESTING OF AN X BAND TWT WHICH WILL BE TAILORED TO THE ARMY'S REQUIREMENTS. IN ADDITION TO THE LOWER COST RF CIRCUIT IT WILL FEATURE STAR MICROWAVE'S LOW COST "PELLET" ELECTRON GUN AND LONG PERIOD FOCUSING, TO FURTHER MINIMIZE COST. THE GOAL IS A 50% REDUCTION IN SELLING PRICE.

SUNREZ CORP

1374 MERRITT DR

EL CAJON, CA 92020

CONTRACT NUMBER: DAAL04-87-C-0062

DR W NOVIS SMITH

TITLE:

REPAIR OF THICK FIBERGLASS REINFORCED PLASTIC STRUCTURES

TOPIC# 104

OFFICE: MTL

IDENT#: 17321

A MAJOR CONCERN FOR MAINTAINING THE PERFORMANCE OF VEHICLES PROTECTED BY FIBER REINFORCED PLASTIC (COMPOSITE) ARMOR IS THE IMMEDIATE REPAIR OF BATTLEFIELD BALLISTIC DAMAGE. A NEW SIMPLE, RAPID REINFORCED (COMPOSITE) ARMOR FIELD REPAIR SYSTEM IS BEING DEVELOPED BASED ON A NEW UVa CURABLE THERMOSET PREPREG AND NEW REPAIR TECHNIQUES. THIS PROPOSED REPAIR SYSTEM WILL HAVE AT LEAST SIX MONTH STORABILITY, REQUIRE NO EXTERNAL HEAT, IS COMFORTABLE, HAS EXCELLENT PHYSICAL PROPERTIES, IS SIMPLE TO USE, RELATIVELY INEXPENSIVE AND CAN CURE IN 5 MINUTES. IT ALSO REQUIRES NO MIXING, HAS NO OFFENSIVE FUMES, AND REQUIRES ONLY A PORTABLE UVa LAMP OR ORDINARY LIGHT. OPTIMIZATION OF THE RESIN SYSTEM, PATCH CONFIGURATION AND REPAIR TECHNIQUES WILL

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BE DONE IN PHASE II. THREE DIFFERENT SETS OF PROTOTYPE REPAIR KITS
WILL BE SUBMITTED FOR FIELD TESTING.

SUSQUEHANNA RESOURCES & ENVIRONMENT INC
84 OAK ST
BINGHAMPTON, NY 13905
CONTRACT NUMBER: DAAA21-87-C-0114
TIMOTHY D MASTERS

TITLE:
MULTISENSOR MACHINE VISION BASED TRACKER/INTELLIGENT
GUNNER/ATR SYSTEM DEV FOR DIRECT/INDIRECT FIRE WEAPONS ...
TOPIC# 5 OFFICE: ARDC IDENT#: 17242

WITH THE PHASE I EFFORT, SR&E HAS SHOWN THAT WHILE FLIR IS EXCELLENT
FOR TARGET DETECTION, IT IS POOR FOR TARGET RECOGNITION. THIS
DEFICIENCY CAN BE CORRECTED BY USING A LASER RADAR (LADAR) TO
GENERATE RANGE IMAGERY FOR RECOGNITION, WHICH IS EFFECTIVE EVEN AT
THE FOUR THOUSAND METER RANGE. BY COMBINING FLIR, LADAR AND TV, AN
EFFECTIVE MACHINE VISION SYSTEM CAN BE DEVELOPED FOR TRACKING,
INTELLIGENT GUNNERS AND AUTOMATIC TARGET RECOGNITION (ATR) ANALYSIS.
WHILE THIS WEAPON STATION IS ORIGINALLY CONCEPTUALIZED AS AN
INTELLIGENT GUNNER DECISION AID, IT IS APPLICABLE TO INDIRECT FIRE
WEAPONS, LIKE MOTOR, SINCE ARDEC HAS ALREADY DEVELOPED ROBOTIC ARMS
AND TRACKERS. TO FULLY EXPLOIT OUR ATR TECHNOLOGIES, WE PROPOSE
THESE PHASE II TASKS: (1) TO DEVELOP A PROTO-TYPE WEAPON STATION
FOR INTELLIGENT GUNNERS, (2) TO DETERMINE EFFECTS OF MULTI-SENSOR ON
ATR PERFORMANCE, (3) TO PERFORM HIT-RATE AND FALSE ALARM RATE
ANALYSIS ON IMAGE DATA, AND (4) TO DEVELOP A LOGIC MODULE, BASED ON
THE ABOVE SYSTEMS, FOR INDIRECT FIRE WEAPON APPLICATIONS.
DEMONSTRATIONS OF THESE SYSTEMS WILL BE CONDUCTED EVERY SIX MONTHS,
WITH THE YEAR-END ONES BEING MAJOR FIELD TESTS.

SUTTON M M & ASSOCS
519 - 17TH ST/STE 520
OAKLAND, CA 94612
CONTRACT NUMBER: DAAD09-87-C-0035
MARK SUTTON

TITLE:
A HIGH INTENSITY SOLAR FACILITY FOR SIMULATING THERMAL
NUCLEAR ENVIRONMENT
TOPIC# 213 OFFICE: TECOM IDENT#: 19047

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PHASE II TECHNICAL OBJECTIVES AND APPROACH: DEVELOPING THE DIFFERENT ASPECTS OF THIS CONCEPT SUCH THAT AN 'OPTIMUM' DESIGN RESULTS COULD EASILY CONSUME MORE FUNDS THAN ARE AVAILABLE FOR THIS INVESTIGATION. WE ADDRESS THIS SITUATION BY ALLOWING THE VARIOUS DESIGN SOLUTIONS TO BE THE RESULT OF EACH TEAM MEMBERS BEST JUDGEMENT. TO INSURE THE BEST RESULTS, WE CHOSE EACH TEAM MEMBER FOR THIS EFFORT BECAUSE THEY ARE THE SINGLE MOST QUALIFIED FIRM IN THE AREA FOR WHICH THEY ARE RESPONSIBLE. THE SPECIFIC OBJECTIVES PROPOSED FOR THE PHASE II WORK ARE THE FOLLOWING: 1. IDENTIFY BEST ARRAY DESIGN BASED ON OPERATIONAL PERFORMANCE REQUIREMENTS. 2. IDENTIFY A CANDIDATE ARRAY DESIGN TO BE CONSIDERED FOR CONSTRUCTION. 3. COMPLETE A FIRST ORDER COST ESTIMATE OF THE CANDIDATE ARRAY. 4. FORMULATE RECOMMENDATIONS FOR PHASE III WORK.

SYM-BIOTECH (OLD: VIVCHEM RSCH)

8 FAIRFIELD BLVD - #3

WALLINGFORD, CT -6492

CONTRACT NUMBER:

EDWARD M DAVIS

TITLE:

DESENSITIZING CARBONACEOUS ADSORBENTS TO THE EFFECTS OF HUMIDITY

TOPIC# 30

OFFICE: CRDEC

IDENT#: 17277

PROMISING DESENSITIZING TREATMENTS DEVELOPED BY PHASE I RESEARCH WILL BE OPTIMIZED AS TO REACTION CONDITIONS. ASC WHETLERITE AND BPL CARBON WILL BE COMPARED BY SORPTION-BED EXPERIMENTS, IN TREATED AND UNTREATED FORM AND AT HUMID AND DRY CONDITIONS; TESTS WILL INCLUDE PARAMETERS AND CONDITIONS REFLECTING ACTUAL GAS-MASK CANISTER PERFORMANCE. IN ADDITION TO TESTS WITH SORPTION BEDS, MICROBALANCE EXPERIMENTS WILL MEASURE ADSORPTION KINETICS AND ISOTHERMS. SORBATES WILL INCLUDE A LOW MOLECULAR WEIGHT HYDROCARBON OF HIGH VAPOR PRESSURE, A WATER-SOLUBLE ALCOHOL AND, SPECIFICALLY, HCN AND COCL(2). SPECTROSCOPY AND ELECTRON MICROSCOPY WILL EXPLORE THE FUNDAMENTALS OF THE EFFECTS OF THE TREATMENTS ON THE SORPTION PROCESS.

SYMBIOTICS INC

875 MAIN ST

CAMBRIDGE, MA 02139

CONTRACT NUMBER: DAAB10-87-C-0053

DR ROBERT C PASLAY

TITLE:

ACCESS: A LANGUAGE BASED ENVIRONMENT FOR DISTRIBUTED

ARTIFICIAL INTELLIGENCE SYSTEMS DEVELOPMENT

TOPIC# 319

OFFICE: CECOM/SWL

IDENT#: 17372

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CURRENT RESEARCH IN DISTRIBUTED PROCESSING IS LARGELY FOCUSED ON EXPLOITING PARALLELISM INHERENT IN COMPUTATIONS ON NEW MACHINE ARCHITECTURES. WHILE THIS AREA OF RESEARCH HAS BEEN VERY PRODUCTIVE, IT LARGELY IGNORES A LARGE INSTALLED BASE OF EXISTING COMPUTATIONAL RESOURCES. FURTHERMORE, IT DOES NOT ACCOUNT FOR APPLICATIONS WHOSE COMPUTATIONAL RESOURCES MUST BE PHYSICALLY DISTRIBUTED. CURRENTLY, SYMBIOTICS IS DEVELOPING ACCESS, A LANGUAGE BASED ENVIRONMENT FOR DISTRIBUTED ARTIFICIAL INTELLIGENCE SYSTEMS DEVELOPMENT. ACCESS IS DESIGNED TO ALLOW THE DEVELOPMENT OF DISTRIBUTED KNOWLEDGE-BASED SYSTEMS USING TRANSPARENT INTERPROCESS COMMUNICATION SERVICES. ACCESS IS AN ARCHITECTURE THAT INTEGRATES DISTRIBUTED COMMUNICATION, DESCRIBING DISTRIBUTED RESOURCE STATE, RESOURCE MANAGEMENT AND KNOWLEDGE REPRESENTATION TECHNOLOGIES. DISTRIBUTED DATA STRUCTURE SUBSTRATE, DDSS, IS AN EXTENSIBLE SUBSTRATE OF ACCESS, DESIGNED FOR THE MOVEMENT OF DATA BETWEEN HETEROGENOUS COMPUTING ENVIRONMENTS. DDSS SUPPLIES THE UNDERLYING COMMUNICATION FACILITIES FOR DISTRIBUTED DATA STATE MAINTENANCE, RESOURCE ACCESS AND INTERPROCESS COMMUNICATION. KNOWLEDGE OBJECTS, KNO, IS THE SUBSTRATE COMPONENT OF ACCESS THAT OFFERS AN UNIFORM INTERFACE IN THE FORM OF GENERIC OPERATIONS ON DISTRIBUTED KNOWLEDGE-BASED SYSTEMS. SYSTEM EFFICIENCY AND UPWARD EVOLUTION IS REALIZED BY A DEVELOPMENT ENVIRONMENT THAT ALLOWS THE APPLICATION OF SPECIALIZED KNOWLEDGE REPRESENTATION AND KNOWLEDGE PROCESSING ON THE BASIS OF THE STRUCTURE AND FUNCTION OF THE KNOWLEDGE.

SYNERGISTIC TECHNOLOGY INC
1333 LAWRENCE EXPY - #410
SANTA CLARA, CA 95051
CONTRACT NUMBER: DAAL02-87-C-0106
GEORGE A HAMMA
TITLE:
ENHANCEMENTS TO MULTIEXCITER VIBRATION CONTROL
TOPIC# 55 OFFICE: HDL IDENT#: 17303

BASED ON THE RESULTS OF THE PHASE I ANALYSIS, THREE OPPORTUNITIES HAVE BEEN IDENTIFIED FOR IMPROVEMENT IN MULTIEXCITER VIBRATION CONTROL AT HARRY DIAMOND LABORATORIES: ADVANCED COMPUTATIONS FOR SYSTEM CONTROL, INNOVATIVE CONTROL ALGORITHMS, AND NOVEL INFORMATION DIS-

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PLAY. THE CONTROL PROCESSOR AND ASSOCIATED COMPUTER PERIPHERALS IN THE 3D-VCS WILL BE MOVED TO A GFE MICRO-VAX HOST COMPUTER. USING THE HIGHER-PERFORMANCE MICRO-VAX (APPROXIMATELY THREE TIMES THE PRESENT SPEED) WILL PERMIT TIGHTER CONTROL OF SYSTEM RESPONSE AND MORE EXTENSIVE DATA ANALYSIS TO BE PERFORMED IN REAL TIME, PROVIDING IMPROVED INFORMATION TO THE OPERATOR AND INCREASING THE QUALITY OF THE TEST OPERATION. MODIFICATIONS TO THE CONTROL ALGORITHMS FOR SINE AND RANDOM CONTROL IDENTIFIED DURING THE PHASE I ANALYSIS WILL BE IMPLEMENTED IN THE 3D-VCS SOFTWARE. IMPROVEMENT IN CONTROL PERFORMANCE WITH RESPECT TO NONLINEARITY, ACCURACY, AND STABILITY ARE EXPECTED. THE NOMOCHROME 2D PRIMARY DISPLAY DEVICE WILL BE REPLACED BY THE GFE EVANS AND SUTHERLAND COLOR 3D SYSTEM, WHICH WILL PROVIDE IMPROVED OPERATOR VISIBILITY TO EXISTING DISPLAY FORMATS (HIGHER RESOLUTION, COLOR TAGGING, AND 3D PRESENTATION). NEW DISPLAY FORMATS IDENTIFIED DURING PHASE I WILL BE IMPLEMENTED, PROVIDING UNIQUE VISIBILITY INTO THE SPATIAL DISTRIBUTION OF ENERGY DURING TESTING.

SYNETICS CORP

540 EDGEWATER DR

WAKEFIELD, MA 01880

CONTRACT NUMBER: DAAA21-87-C-0152

ANN T ORLANDO

TITLE:

IMPLEMENTATION TEST AND EVALUATION OF A VOICE ACTIVATED
WEAPONS CONTROL SYSTEM FOR ARMY HELICOPTERS

TOPIC# 11 OFFICE: ARDEC IDENT#: 17261

THIS PHASE II SBIR WILL RESULT IN AUTOMATIC SPEECH RECOGNITION (ASR) SYSTEM FOR ARMY HELICOPTERS. KEY TASKS IN THIS EFFORT WILL INCLUDE EXTENSION OF THE PHASE I APPLICATION VOCABULARY, DEVELOPMENT OF ENHANCEMENT TECHNIQUES, AND EXTENSIVE TEST AND EVALUATION OF THE SYSTEM IN A SIMULATED COCKPIT ENVIRONMENT. OF PARTICULAR IMPORTANCE WILL BE THE DEVELOPMENT OF ASR PERFORMANCE EVALUATION CRITERIA BASED UPON MISSION EFFECTIVENESS. THIS SYSTEM WILL BE DESIGNED AROUND THE ITT SPEECH SYSTEM WHICH HAS BEEN USED IN OTHER ARMY HELICOPTER ASR PROGRAMS. DURING THE DESIGN AND TEST PHASES HELICOPTER PILOT SUGGESTIONS WILL BE INCORPORATED INTO THE SYSTEM TO ENSURE ACCEPTANCE AND USEFULNESS BY THE ULTIMATE USERS OF THIS SYSTEM.

SYSTEMS & PROCESSES ENGINEERING CORP

1406 SMITH RD - STE A

AUSTIN, TX 78721

CONTRACT NUMBER: DAAA15-87-C-0053

NEWTON B PENROSE

TITLE:

COMBAT SUPPORT ROBOTICS ADVANCED CONCEPTS AND SYSTEM ANALYSIS
PROGRAM

TOPIC# 324 OFFICE: ARDEC IDENT#: 14975

SUBMITTED BY

AN INTEGRATED ROBOTICS SYSTEMS TRADE STUDY TO IDENTIFY, ANALYZE, AND PRIORITIZE ADVANCED ROBOTICS TECHNOLOGY APPLICATIONS FOR ENHANCING ARMY FORCE STRUCTURES FROM TODAY THROUGH THE YEAR 2010 (COMBAT SUPPORT SPECIFIC). AN INTERACTIVE COST/BENEFIT COMPUTER MODEL--ROBOT ASSESSMENT MODEL (RAM)--A FIRST ORDER TOOL, USED TO EVALUATE THE COST/RISK EFFECTIVENESS OF ROBOTICS SYSTEMS AGAINST TACTICAL SCENARIOS. AN ASSESSMENT OF "LEADING EDGE" ROBOTICS TECHNOLOGY WITH POTENTIAL MILITARY AND COMMERCIAL APPLICATIONS. A COMPREHENSIVE EVALUATION OF ARMY TACTICAL ROBOTIC SCENARIOS AND CONCEPTS WITH RECOMMENDATIONS OF NEAR AND LONG TERM DEVELOPMENT STRATEGIES...OPENING THE GATEWAY TO A PHASE II ROBOT PROTOTYPE.

TACAN CORP
2111 PALOMAR AIRPORT RD - STE 270
CARLSBAD, CA 92008
CONTRACT NUMBER: DAAD05-87-C-0022
DR MICHAEL M SALOUR
TITLE:
HIGH RESOLUTION TEMPERATURE MEASUREMENTS
TOPIC# 195 OFFICE: TECOM IDENT#: 15242

DURING PHASE II WE WILL CONSTRUCT AND TEST A HIGH-RESOLUTION, FIBER-OPTIC TEMPERATURE SENSOR FOR MICROMETEOROLOGICAL APPLICATIONS. OUR SUCCESSFUL PHASE I EFFORT HAS DEMONSTRATED THAT WE CAN ACHIEVE 0.01 DEG C ACCURACY AND PRECISION WITH THIS DEVICE. DURING PHASE II OUR EFFORTS WILL PROVIDE FOR A FOUR CHANNEL THERMOMETER WITH FIBER SENSORS THAT ALLOW FOR TEMPERATURE MEASUREMENTS AT 2, 4, 8, AND 16mm HEIGHTS ABOVE A SURFACE. THE GROUND LOOP RESISTANT ELECTRONICS WILL BE HOUSED IN A RUGGED WATER-TIGHT HOUSING THAT IS IMMUNE TO MARINE ENVIRONMENTS. WE EXPECT THE SENSOR TO PROVIDE FOR MEASUREMENTS BETWEEN -40 DEG C AND +50 DEG C AT DATA RATES OF 10 Hz PER CHANNEL. THE SENSOR TIP WILL BE DESIGNED FOR EASY REPLACEMENT IF NECESSARY, AND THE READOUT WILL BE BY BOTH DIGITAL DISPLAY AND RS-232 INTERFACE. THE TEMPERATURE SENSOR WILL PROVIDE FOR FIELD CALIBRATION TO ENSURE HIGH ACCURACY.

TANNER RESEARCH INC (FORMELY: STAC)
126 W DEL MAR BLVD
PASADENA, CA 91105
CONTRACT NUMBER: DAAD01-87-C-0069
DR JOHN E TANNER
TITLE:
HIGH SPEED IMAGING ARRAY VIDEO CAMERA AND RECORDER DEVELOPMENT
TOPIC# 222 OFFICE: TECOM IDENT#: 15103

SUBMITTED BY

SENSOR: WE PROPOSE TO CONTINUE THE INVESTIGATION AND DEVELOPMENT OF A HIGH-SPEED IMAGING SENSOR BASED ON A CUSTOM MOS INTEGRATED CIRCUIT. THE SENSOR WILL HAVE AN IMAGING RESOLUTION OF AT LEAST 256X256 PIXELS AND OPERATE AT FRAME RATES OVER 2,000 FRAMES/SECOND. RESEARCH PRESENTLY UNDERWAY MAY RESULT IN SUCH A SENSOR ARRAY BY THE TIME THIS CONTRACT BEGINS. CAMERA: WE WILL DESIGN AND FABRICATE A PROTOTYPE OF A HIGH-SPEED VIDEO CAMERA BASED ON THE IMAGING ARRAY. THE DESIGN WILL INCLUDE OPTICAL, MECHANICAL, AND ELECTRONIC COMPONENTS. THE CAMERA WILL SUPPLY THE VIDEO DATA ON PARALLEL OUTPUTS. RECORDER: WE WILL DESIGN AND FABRICATE A PROTOTYPE OF A HIGH-SPEED PARALLEL VIDEO DATA RECORDER BASED ON SOLID-STATE MEMORY COMPONENTS. PRELIMINARY ANALYSIS SUGGESTS THAT THE CAMERA AND RECORDER WILL BE CLOSELY INTEGRATED INTO A CAMCORDER UNIT. SYSTEM: AT THE CONCLUSION OF THIS CONTRACT, WE WILL DELIVER TO YUMA PROVING GROUND A FULLY FUNCTIONAL, FULL SPEED VIDEO CAMERA/RECORDER SYSTEM.

TECHNICAL SOLUTIONS INC
PO BOX 1148
MESILLA PARK, NM 88047
CONTRACT NUMBER: DAAA21-87-0112
DR ALTON L GILBERT
TITLE:
OPEN SYSTEMS INTEGRATION OF INTELLIGENT SUBSYSTEMS
TOPIC# 1 OFFICE: ARDEC IDENT#: 17234

A NEED EXISTS TO DEVELOP A METHODOLOGY FOR DISTRIBUTED CONTROL AND COMMUNICATIONS WITHIN A COLLECTION OF HETEROGENEOUS, INTELLIGENT SYSTEMS. THIS METHODOLOGY MUST BE ROBUST, PROVIDING REAL-TIME, FAULT TOLERANT, INTERRUPT DRIVEN SYSTEM PERFORMANCE, IN A ROBOTIC ENVIRONMENT. THE WORK PERFORMED BY TSI UNDER PHASE I, THE DESIGN AND ANALYSIS OF A MESSAGE-PASSING SYSTEM TO ACCOMPLISH THIS TASK, WILL BE EXPANDED, IMPLEMENTING THE MESSAGE-PASSING SYSTEM AND PROVIDING SEVERAL TOOLS FOR FACILITATION OF SUBSYSTEM SOFTWARE DEVELOPMENT. ADDITIONAL RESEARCH WILL ALSO BE CONDUCTED, ADDRESSING THE ISSUES OF BOTH EXPANDING AND EXTENDING THE MESSAGE-PASSING SYSTEM. THE SYSTEM IS DESIGNED TO BE BOTH EXPANDABLE AND EXTENSIBLE, AND THESE OPPORTUNITIES MUST BE PURSUED. THE SYSTEM IS EXPANDABLE BECAUSE IT IS DESIGNED TO ALLOW INTERCONNECTION OF ADDITIONAL SUBSYSTEMS OF NEW

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TYPES. THE SYSTEM IS EXTENSIBLE BECAUSE IT IS DESIGNED TO ALLOW FOR INCREASED FUNCTIONALITY OVER TIME.

TECHNICAL SOLUTIONS INC
PO BOX 1148
MOSILLA PARK, NM 88047
CONTRACT NUMBER: DAAD09-87-C-0042
DR ALTON L GILBERT
TITLE:
REAL-TIME IMAGE PRE-PROCESSING
TOPIC# 201 OFFICE: TECOM IDENT#: 19037

IN ANY IMAGE PROCESSING SYSTEM, ENHANCEMENT OF THE IMAGE VIA PRE-PROCESSING CAN SIGNIFICANTLY IMPROVE THE SYSTEM PROCESSING CAPABILITY. IN THE CASE OF TRACKING SYSTEMS, IMAGE ENHANCEMENT IMPROVES ABILITY TO TRACK THE TARGET. IN AN UNCONTROLLED ENVIRONMENT, THE CAPABILITY TO PRE-PROCESS THE IMAGE IN A VARIETY OF WAYS IS HIGHLY DESIRABLE, WITH SELECTION DEPENDING ON THE CURRENT TRACKING ENVIRONMENT. THIS RESEARCH WILL EXAMINE PRE-PROCESSING ALGORITHMS, IDENTIFYING THESE ALGORITHMS BY CLASSES, AND APPLYING THE PRE-PROCESSOR CLASSES TO A SELECTED BENCHMARK OF TRACKING SEQUENCES. CONCLUSIONS WILL BE DRAWN FROM THE DATA GENERATED AS TO THE EFFICIENCY OF THE PRE-PROCESSOR CLASSES IN A TRACKING ENVIRONMENT. AN EXPERT SYSTEM WILL BE DEVELOPED THAT WILL ALLOW FOR SWITCHING PRE-PROCESSORS ON THE FLY. REQUIREMENTS FOR INCORPORATING PRE-PROCESSOR CLASSES INTO TRACKER ARCHITECTURES WILL BE ADDRESSED.

TOOMAY MATHIS & ASSOCS INC
PO BOX 3118
BOZEMAN, MT 59772
CONTRACT NUMBER: DAAD07-87-C-0083
KYLE A KLICKER
TITLE:
MODEL OF PORT SCATTER FROM LASERS
TOPIC# 70 OFFICE: ASL/LABCOM IDENT#: 16013

THE GOAL OF THIS PROPOSAL IS DEVELOPMENT OF A MODEL THAT PREDICTS

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LIGHT SCATTER FROM LASER PORT OPTIS. THE PROPOSED MODEL CONSISTS OF THREE MAIN SOFTWARE MODULES THAT CALCULATE THE SPECULAR BEAM AND STRAY LIGHT LEVELS AS LIGHT PROPAGATES THROUGH THE LASER PORT OPTICAL SYSTEM. THE FIRST MODULE IS A DATA BASE THAT MANAGES ANGULAR SCATTER CHARACTERISTICS OF INDIVIDUAL OPTICAL COMPONENTS. ENTRY GENERATION IS BY CURVE FITTING TO MEASURED SCATTER DATA OR BY AN ANALYTICAL ESTIMATION TECHNIQUE USING DIFFRACTION AND SCATTERING CODES ALONG WITH COMPONENT SURFACE FINISH, MATERIAL AND QUALITY STANDARDS. THE SECOND MODULE IS A RAY-TRACING PROGRAM USED FOR OPTICAL SYSTEM DESCRIPTION, DESIGN AND ALIGNMENT. THE THIRD MODULE MODELS SCATTER AT THE SYSTEM LEVEL. SCATTER AS A FUNCTION OF ANGLE FROM THE OUTPUT SPECULAR BEAM IS CALCULATED FROM GIVEN SOURCE SPECIFICATIONS, SYSTEM GEOMETRY AND COMPONENT SCATTER. OUTPUT CAN BE UTILIZED WITH DETECTOR AND SENSOR INFORMATION TO PREDICT THE RANGE AND ANGLES OVER WHICH LASER PORTS CAN BE DETECTED. GIVEN THE SYSTEM SCATTER, THE MODEL CAN ALSO BE USED TO PREDICT SCATTER FROM ONE COMPONENT IN THE SYSTEM, OR TO INFER INFORMATION ABOUT THE LASER SOURCE. SCATTER FROM THE ATMOSPHERE IS MODELED USING AVAILABLE ATMOSPHERIC SCATTERING CODES.

TRANS-AMERICAN IMMUNOLOGY INC
30 FAYETTE ST
NORTH QUINCY, MA 02171
CONTRACT NUMBER: DAAAL5-87-C-0048
DR C BLANCHARD
TITLE:
REGENERATION OF IMMUNOLOGICALLY-ACTIVE SURFACES
TOPIC# 28 OFFICE: CRDEC IDENT#: 17274

THE OBJECTIVE OF THE STUDY IS TO DEFINE CONDITIONS FOR RAPIDLY DISSOCIATING ANTIGEN, HAPTEN, BACTERIA AND VIRUS FROM SOLID SURFACE BOUND ANTIBODY WITHOUT ALTERING ANTIBODY AFFINITY OR SPECIFICITY SO THAT REGENERATED SURFACES CAN BE USED REPEATEDLY TO SPECIFICALLY CAPTURE AND DETECT ANTIGEN OR HAPTEN. POLYCLONAL AND MONOCLONAL ANTIBODY (IgG, F(ab)2 AND Fab FRAGMENTS) WILL BE COVALENTLY BOUND TO SOLID SURFACES INCLUDING GLASS BEADS, POLYSTYRENE BEADS, IMMOBILON AND IMMUNODYNE MEMBRANES AND POLYSTYRENE MICROTITER PLATES. TESTS WILL BE DONE TO DETERMINE HOW WELL ANTIBODY IS COVALENTLY BOUND TO THE SOLID SURFACE AND HOW WELL ANTIGEN IS DISSOCIATED FROM THE BOUND

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ANTIBODY. MODEL SYSTEMS WILL BE USED TO EXAMINE DISSOCIATION OF SOLUBLE ANTIGEN, HAPTEN AND INSOLUBLE ANTIGEN FROM COVALENTLY BOUND ANTIBODY. THE MODEL SYSTEM FOR STUDYING DISSOCIATION OF SOLUBLE ANTIGEN FROM BOUND ANTIBODY WILL BE THE ANTIHUMAN IgG SYSTEM USED IN THE PHASE I EFFORT. THE MODEL SYSTEM FOR STUDYING DISSOCIATION OF HAPTEN FROM BOUND ANTIBODY WILL BE THEOPHYLLINE AND FLUORESCIN AND THEIR RESPECTIVE ANTIBODIES. THE MODEL SYSTEM FOR STUDYING DISSOCIATION OF ANTIBODY-INSOLUBLE ANTIGEN COMPLEXES WILL USE E. COLI AND HIV AND THEIR RESPECTIVE ANTIBODIES.

TSI INC
PO BOX 64394
ST PAUL, MN 55164
CONTRACT NUMBER: DAAE07-87-C-R055
RICHARD J REMIARZ
TITLE:
DUST DETECTOR
TOPIC# 159 OFFICE: TACOM IDENT#: 17375

A .3AK IN A VEHICLE'S AIR INTAKE SYSTEM CAN ALLOW IN LARGE AMOUNTS OF ROAD DUST. DUST CAN QUICKLY RUIN THE ENGINE IF THE LEAK GOES UNNOTICED. THE DUST DETECTOR GIVES THE DRIVER AN IMMEDIATE WARNING OF AN IR INTAKE LEAK. THE DUST DETECTOR MONITORS DUST PARTICLES ABOVE A CERTAIN SIZE IN THE AIR INTAKE SYSTEM. A LEAK CAUSES AN INCREASE IN DUST PARTICLES, WHICH THE DUST DETECTOR MEASURES. IF THE PARTICLE COUNT IS GREAT ENOUGH, AN ALARM SOUNDS WITHIN SECONDS. TSI PROPOSES TO ENGINEER A RUGGEST DUST DETECTOR THAT WILL OPERATE ON VARIOUS MILITARY VEHICLES.

VERITAY TECHNOLOGY INC
PO BOX 305 - 4845 MILLERSPORT HWY
EAST AMHERST, NY 14051
CONTRACT NUMBER: DAAA15-87-C-0046
EDWARD B FISHER
TITLE:
INVESTIGATE THE COMBUSTION MECHANISMS OF BORON HYDRIDE ENHANCED PROPELLANT FOR INSENSITIVE MONOLITHIC CHARGE AND VHBR APPLICATION
TOPIC# 83 OFFICE: BRL IDENT#: 16151

SUBMITTED BY

COMPOSITE PROPELLANTS CONTAINING BORON HYDRIDE COMPOUNDS WERE ORIGINALLY DEVELOPED FOR USE IN THE TRAVELLING CHARGE CONCEPT AS IMPLEMENTED BY THE BALLISTIC RESEARCH LABORATORY. THESE PROPELLANTS EXHIBIT UNIQUE PROPERTIES, MOST NOTABLY AN ABILITY TO PROPAGATE IN-DEPTH COMBUSTION REACTIONS IN THE ABSENCE OF POROSITY. A NUMBER OF POTENTIAL ADVANCED BALLISTIC APPLICATIONS, SUCH AS MONOLITHIC PROPELLANTS, ARE POSSIBLE WITH THIS FAMILY OF PROPELLANTS; HOWEVER, A LACK OF FUNDAMENTAL UNDERSTANDING OF THE VHBR PROPELLANT COMBUSTION MECHANISMS LIMITS THEIR APPLICATION. ADVANCED DIAGNOSTIC TECHNIQUES SUCH AS HIGH SPEED X-RAY CINEMATOGRAPHY AND FIBER OPTIC LIGHT DETECTION WERE APPLIED TO THE PROBLEM DURING PHASE I; THESE TESTS PRODUCED A BETTER UNDERSTANDING OF THE COMBUSTION MECHANISMS. FURTHER TECHNIQUES WILL BE DEVELOPED DURING THE NEW YORK STATE MATCHING FUNDS PROGRAM. DURING THE PHASE II PROGRAM, ADVANCED DIAGNOSTICS WILL BE USED TO:

1. PERFORM CLOSED BOMB AND ADVANCED DIAGNOSTIC MEASUREMENTS TO AN EFFORT TO CHARACTERIZE COMBUSTION BEHAVIOR.
2. IDENTIFY AND DEVELOP RELATIONSHIPS BETWEEN FORMULATION AND PHYSICAL VARIABLES AND THE RESULTING COMBUSTION PARAMETERS.
3. DEVELOP MODELS, (BOTH QUALITATIVE AND QUANTITATIVE) WHICH ENHANCE OUR KNOWLEDGE OF THE COMBUSTION MECHANISMS. THE GOAL OF THIS PHASE II PROGRAM IS TO DEVELOP THE EXPERIMENTAL AND THEORETICAL DATA BASE NECESSARY FOR APPLICATION OF THIS CLASS OF PROPELLANTS.

VERITAY TECHNOLOGY INC
PO BOX 305 - 4845 MILLERSPORT HWY
EAST AMHERST, NY 14051
CONTRACT NUMBER: DAAA21-87-C-0129
EDWARD B FISHER

TITLE:

ENCASED STICK PROPELLANT

TOPIC# 22 OFFICE: ARDEC

IDENT#: 17268

UNDER PHASE I SBIR FUNDING, VERITAY TECHNOLOGY DEMONSTRATED THE FEASIBILITY OF CONSOLIDATING M31 STICK PROPELLANT INTO LARGE HAVING BOTH THE PHYSICAL DIMENSIONS AND INHERENT STRENGTH NECESSARY FOR USE IN THE 155mm HOWITZER. CONSOLIDATION AND PRESSING TECHNIQUES WERE DEVELOPED THAT PRODUCED A CHARGE CAPABLE OF WITHSTANDING A FIVE-FOOT UNCASED DROP AND THERMAL SHOCK CYCLING FROM +145 DEG F TO

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-91 DEG F. THE PHASE II EFFORT WILL EXPLORE ADDITIONAL PROMISING CONSOLIDATION TECHNIQUES, REFINE ENCAPSULATION TECHNIQUES, AND DETERMINE A "MOST-PROMISING" DESIGN FOR ADVANCED DEVELOPMENT. FULL-SCALE CONSOLIDATED CHARGES WILL BE DESIGNED AND FABRICATED FOR TESTING IN THE HALF-CHAMBER OR WHOLE-CHAMBER IGNITION FIXTURES LOCATED AT VERITAY. CHARGES OF VARIOUS DESIGN CONFIGURATIONS WILL BE INSTRUMENTED AND FIRING TESTS WILL BE CONDUCTED IN VERITAY'S UNDERGROUND RANGES TO ESTABLISH THE INFORMATION BASE NECESSARY TO ESTABLISH A FULL-SCALE PRODUCTION OPERATION.

VISTA RESEARCH CORP
3826 SNEAD DR
SIERRA VISTA, AZ 85635
CONTRACT NUMBER: DAAB07-87-C-P057
DR J G CALDWELL
TITLE:
RESEARCH IN ARTIFICIAL INTELLIGENCE FOR NON-COMMUNICATIONS
ELECTRONIC WARFARE SYSTEMS
TOPIC# 291 OFFICE: CECOM/EW IDENT#: 17402

THE PURPOSE OF THE PROPOSED RESEARCH IS TO DEVELOP AN ARTIFICIAL-INTELLIGENCE (AI)-BASED SYSTEM FOR AUTOMATICALLY GENERATING MILITARY SCENARIOS. THESE SCENARIOS WOULD BE USED TO SPECIFY INITIAL CONDITIONS FOR TACTICAL COMBAT MODELS AND FOR COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE (C3I) SYSTEM EVALUATION MODELS. THE MOTIVATION FOR THE PROPOSED DEVELOPMENT IS TO REDUCE THE TIME AND COST OF SCENARIO PREPARATION, SO THAT MILITARY SIMULATION AND MODELING MAY BE BASED ON BROAD-SCOPE SAMPLES OF SCENARIOS RATHER THAN ON A SINGLE SCENARIO, AS IS OFTEN THE CASE TODAY.

VMS CONSULTING ENGINEERS
255 HEWLETT NECK RD
WOODMERE, NY 11598
CONTRACT NUMBER: DAAL02-87-C-0116
VICTOR M SERBY
TITLE:
AN ORDNANCE FUZE POWER SOURCE ASSEMBLED FROM COMMERCIALY
AVAILABLE BATTERIES
TOPIC# 59 OFFICE: HDL IDENT#: 17304

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THIS PHASE II IS THE PROOF OF CONCEPT TO SHOW THAT COMMERCIAL BATTERIES SELECTED DURING PHASE I AND INTERIM RESEARCH ACTUALLY PERFORM IN A FORM FIT AND FUNCTION POWER SOURCE UNDER THE SAME CONDITIONS AS THE MIL VERSION. WHILE PHASE I DEMONSTRATED THAT ASSEMBLIES OF SELECTED COMMERCIAL CELLS WILL WORK IN THE MILITARY ENVIRONMENT FROM BOTH AN ANALYTICAL AND ENGINEERING PROTOTYPE STAND-POINT, PHASE II WILL DEMONSTRATE AN EQUIVALENT P.S. CAN BE MADE IN MANUFACTURING ENVIRONMENT. IN ADDITION, THE FINISHED BATTERY ASSEMBLIES WILL BE ANALYZED FROM A SAFETY STANDPOINT TO INSURE THEY CAN BE USED IN AN ENVIRONMENT CONTAINING MUNITIONS.

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TOTAL NUMBER OF AWARDS: 125

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ABARIS
125 CATRON DR
RENO, NV 89512
CONTRACT NUMBER:
WILLIAM L MURPHY
TITLE:
EXPERT SYSTEM FOR IMPROVED MAINTENANCE AIDING (REVISED TECHNICAL
AND OBJECTIVES AND WORK STATEMENT MAID)
TOPIC# 46 OFFICE: NAVSEA IDENT#: 16393

THIS PHASE II EFFORT BUILDS ON THE PHASE I WHICH ESTABLISHED THE
FEASIBILITY OF COMBINING A MODERN PORTABLE COMPUTER WITH AN EXPERT
SYSTEM SHELL OPERATED BY VOICE, AND AUGMENTED BY GRAPHICS, TO AID A
MAINTENANCE TECHNICIAN IN THE DIAGNOSIS AND REPAIR OF COMPLEX NAVY
EQUIPMENT. EXPERT SYSTEMS RULES, REPRESENTATIVE GRAPHICS, AND SPEECH
VOCABULARY WERE DEVELOPED WHICH LEAD THE TECHNICIAN THROUGH THE
DIAGNOSIS AND REPAIR PROCEDURES OF TWO AN/BBQ-5 SONAR SYSTEM PROBLEMS
WITHOUT REFERENCE TO PRINTED DOCUMENTS. A REPORT CAPABILITY IS
PROVIDED WHICH COLLECTS INFORMATION DURING THE DIAGNOSES AND REPAIR
PROCESS AND PRINTS OUT A REPORT. THE PHASE II WORK IS TO DEVELOP A
HORIZONTALLY INTEGRATED SOFTWARE AND HARDWARE SYSTEM THAT SERVES THE
NEEDS OF THE REPAIR TECHNICIAN. IT INCLUDES ANALYSIS OF THE METHODS
OF ENTERING THE DIAGNOSTIC KNOWLEDGE TREE, DISPLAY GRAPHIC
REQUIREMENTS, REPORT GENERATION FOR OPERATOR AND MANAGEMENT NEEDS.
THE SYSTEM INTEGRATED FOR USE WITH THE AN/BQQ-5 WILL BE FURTHER
EXPLORED TO DEVELOP A MODULAR INPUT SYSTEM, ZOOM AND HIGH
RESOLUTION GRAPHICS, ALTERNATIVE INPUT SYSTEMS, SUCH AS ADVANCED
SPEECH RECOGNITION AND SYNTHESIS, AND TOUCH PADS. THE INITIAL TOOL
FOR THIS RESEARCH WILL BE THE DOLCH COMPUTER AND THE XI PLUS EXPERT
SYSTEM.

ACOUSTICAL RESEARCH & APPLICATION
304 MASHIE DR SE
VIENNA, VA 22180
CONTRACT NUMBER:
DR ALAN O SYKES
TITLE:
PVDF COPOLYMER RIBBON AND ANNULAR HYDROPHONES AS CANDIDATE
LOW COST ACOUSTIC SENSORS
TOPIC# 55 OFFICE: NAVSEA IDENT#: 16432

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IN THE PHASE I CONTRACT, ANALYTICAL MODELS WERE DEVELOPED FOR PREDICTING THE RESPONSE OF PIEZOELECTRIC HYDROPHONES TO SOUND PRESSURE, FORCE, ACCELERATION, AND BENDING. THESE MODELS WERE USED TO INVESTIGATE CAUSES OF NOISE IN POLY-VINYLDENE (PVDF) HOMOPOLYMER WIRE HYDROPHONES AND TO PREDICT THE RESPONSES OF THICK RIBBON AND ANNULAR PVDF COPOLYMER HYDROPHONES, BOTH WITH A RIGID MANDREL AND HOLLOW, WITH ESTIMATED VALUES FOR THE DIELECTRIC, COMPLIANCE, AND PIEZOELECTRIC CONSTANTS OF THE COPOLYMER MATERIAL. THE MODELS INDICATE THAT TENSILE STRAINS IN THE CENTRAL WIRE IN PVDF WIRE HYDROPHONES, AND BENDING OF THE WIRE, BECAUSE OF NONUNIFORMITIES IN THE PVDF COATING THICKNESS AND POLARIZATION, ARE THE PROBABLE CAUSES OF HIGH SELFNOISE, RATHER THAN ACCELERATION. THE MODELS ALSO INDICATE THAT PVDF COPOLYMER RIBBON AND ANNULAR HYDROPHONES HAVING SIZES, SHAPES, WEIGHTS, SENSITIVITIES, AND CAPACITANCES SUITABLE FOR NAVAL APPLICATIONS MAY BE FEASIBLE. SINCE COST OF PVDF MATERIAL FOR A HYDROPHONE IS OF THE ORDER OF A DOLLAR OR SO, THESE HYDROPHONES ARE CANDIDATES FOR LOW COST SENSORS. THIS PROPOSAL IS TO MEASURE THE DIELECTRIC, COMPLIANCE, AND PIEZOELECTRIC PROPERTIES OF PVDF COPOLYMER MATERIAL, CONSTRUCT AND EVALUATE EXPERIMENTAL THICK RIBBON AND ANNULAR HYDROPHONES SUITABLE FOR FIELD TESTS, AND INVESTIGATE LOW COST METHODS FOR THEIR MANUFACTURE.

ADVANCED SYSTEM TECHNOLOGIES INC
12200 E BRIARWOOD AVE - STE 260
ENGLEWOOD, CO 80112

CONTRACT NUMBER:

DR ROBERT T GOETTGE

TITLE:

INTEGRATED RELIABILITY AND TIMING DESIGN ANALYSIS TOOL

TOPIC# 142 OFFICE: NSWC IDENT#: 17782

DURING DEVELOPMENT OF COMPLEX, EMBEDDED COMPUTER SYSTEMS QUANTITATIVE TRADEOFFS OF RELIABILITY AND PERFORMANCE ARE SIGNIFICANT DESIGN CONSIDERATIONS. PHASE I DEMONSTRATED THE FEASIBILITY OF AN INTEGRATED RELIABILITY AND TIMING DESIGN ANALYSIS TOOL WHICH WOULD BE CAPABLE OF PROVIDING QUANTITATIVE DATA. PHASE II WILL ADDRESS TWO TECHNICAL OBJECTIVES: (1) DEVELOP A PROTOTYPE INTEGRATED RELIABILITY AND TIMING DESIGN ANALYSIS TOOL; AND (2)

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DEMONSTRATE THE UTILITY OF INTEGRATED RELIABILITY/TIMING ANALYSES BY APPLICATION OF THE PROTOTYPE TO REAL-WORLD EXAMPLES. THE PROTOTYPE TOOL WILL BE DEVELOPED BY ADDING THE RELIABILITY REPRESENTATION CONSTRUCTS AND ANALYSES DEFINED IN PHASE I TO AN EXISTING TIMING ANALYSIS TOOL. THE RESULTING PROTOTYPE TOOL WILL HAVE AN ICONIC SYSTEM DESIGN CAPTURE INTERFACE. IN ADDITION TO STANDARD TIMING MEASURES, THE TOOL WILL PRODUCE THREE MEASURES OF RELIABILITY. THE TOOL WILL BE DEMONSTRATED BY APPLICATION TO A LARGE SCALE COMPUTER SYSTEM HAVING STRINGENT RELIABILITY AND TIMING REQUIREMENTS.

AERO-VIRONMENT INC

825 MYRTLE AVE

MONROVIA, CA 91016

CONTRACT NUMBER:

GEORGE P ETTENHEIM JR

TITLE:

HIGH RESOLUTION: LOW ALTITUDE FLIGHT TEST MINI-SODAR ANEMOMETER

GROUND STATION FOR HELICOPTER AND VERTICAL TAKEOFF LANDING AIRCRAFT

TOPIC# 257 OFFICE: NAVAIR/NATC IDENT#: 17718

IMPROVEMENTS IN DOPPLER ACOUSTIC RADAR TECHNOLOGY NOW PROVIDE THE POTENTIAL FOR A CONVENIENT AND ECONOMICAL INDIRECT PROBING INSTRUMENT CAPABLE OF MONITORING WIND AND TURBULENCE IN THE LOWEST SEVERAL HUNDRED METERS OF THE ATMOSPHERE. THE KEY FACTORS ON WHICH THE "CONVENIENT AND ECONOMICAL" FEATURES ARE BASED ARE INCREASED BY THE USE OF HIGH FREQUENCIES, ADVANCES IN DIGITAL DATA HANDLING TECHNIQUE, AND THE USE OF A PHASED ARRAY METHOD OF BEAM TILTING, ALL COMBINED IN AN INNOVATIVE SYSTEM DESIGN THAT BUILDS AROUND A MINI-COMPUTER AND PROCEDURES A VERSATILE, PORTABLE WIND MONITORING SYSTEM (MINI-SODAR). THE HIGH FREQUENCY ASPECT WHICH PERMITS HIGH RESOLUTION IN TIME AND SPACE HAS ONE MAIN DISADVANTAGE: INCREASED ATMOSPHERIC ABSORPTION. WHERE A PRACTICAL 1500 Hz SYSTEM OPERATING IN A QUIET ENVIRONMENT WILL HAVE A MEDIAN HEIGHT RANGE CAPABILITY OF 600 M, AT 4500 Hz THIS WILL BE AROUND 200 M. FORTUNATELY, THERE ARE MANY NEEDS FOR CONTINUOUS, REMOTE MONITORING WITHIN THIS LOWER RANGE, SUCH AS WIND EFFECTS ON AIRCRAFT IN LANDING AND TAKEOFF AND ON HELICOPTERS DURING HEAVY LIFT MANEUVERS, PREDICTION OF DIFFUSION OF POLLUTANTS RELEASED NEAR THE SURFACE AND ESTABLISHING WIND

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STATISTICS FOR WIND FARM DESIGN AND VIABILITY STUDIES. A RESEARCH APPLICATION WILL BE PROBING TRANSIENT PHENOMENA OF AIRCRAFT WAKE DECAY.

AERO-VIRONMENT INC
825 MYRTLE AVE
MONROVIA, CA 91016
CONTRACT NUMBER:
GRAHAM GYATT

TITLE:

DEVELOPMENT AND DEMONSTRATION OF A PROTOTYPE EXPENDABLE GLIDER SYSTEM TO EXPEDITE SONAR

TOPIC# 190 OFFICE: NADC/NAVAIR IDENT#: 19079

DEPLOYMENT OF RECTANGULAR ARRAYS OF SONAR BUOYS ON THE OCEAN SURFACE WOULD BE EXPEDITE IF MULTIPLE ROWS COULD BE LAID DURING A SINGLE PASS OF THE LAUNCH AIRCRAFT. THIS WOULD REQUIRE SOME OF THE BUOYS TO GLIDE PERPENDICULAR TO THE FLIGHT PATH OF THE DISPENSING AIRPLANE. THIS PHASE II PROGRAM WOULD BUILD ON THE RESEARCH OF PHASE I CULMINATING IN A DEMONSTRATION DROP OF PROTOTYPE SYSTEMS FROM AN AIRCRAFT IN WHICH THREE ROWS OF BUOYS ARE LAID SIMULTANEOUSLY. THE PROPOSED PHASE II PROGRAM CONSISTS OF THE FOLLOWING TASKS: 1) SPECIFICATION OF DESIGN REQUIREMENTS, 2) AERODYNAMIC DEVELOPMENT TO ACHIEVE A GLIDE RATIO BETWEEN 2.5:1 AND 5:1, 3) SENSING AND GUIDANCE SYSTEM DEVELOPMENT TO STEER THE VEHICLE ON THE CORRECT HEADING, 4) STRUCTURAL AND DEPLOYMENT SYSTEM DEVELOPMENT, 5) SYSTEMS INTEGRATION, 6) DEMONSTRATION FLIGHT, AND 7) REPORTING. THERE ARE MANY TRADEOFFS BETWEEN THE REQUIRED DEPLOYED BUOY PATTERN, THE PRECISE BUOY SPECIFICATIONS, AND THE TECHNIQUES FOR ACHIEVING STABILITY AND CONTROL, ALL CONSIDERED WITHIN A FRAMEWORK OF RELIABILITY AND LOW COSTS IN MASS PRODUCTION. THIS WILL THEREFORE BE AN INTERACTIVE SYSTEMS ENGINEERING PROGRAM. THE OBJECTIVE WILL BE THE DEVELOPMENT AND DEMONSTRATION OF A COMPLETE PROTOTYPE SYSTEM WHICH COULD FORM THE BASIS FOR A MASS PRODUCTION VERSION.

AERODYNE RESEARCH IN
45 MANNING RD
BILLERICA, MA 01821
CONTRACT NUMBER:

DR ROBERT L HUGUENIN

TITLE:

SYNTHETIC MODELING OF SHIPBORNE IRST CLOUD/SEA INFRARED RADIANCE SCENES

TOPIC# 141 OFFICE: NSWC IDENT#: 17781

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BACKGROUND CLUTTER HAS A MAJOR IMPACT ON IRST SYSTEMS. SYNTHETIC MODELING OF IR BACKGROUND SCENES IS AN IMPORTANT ADJUNCT TO THE CURRENT MEASUREMENT PROGRAM, PROVIDING ENHANCED UNDERSTANDING OF CLUTTER PHENOMENA, AS WELL AS A PREDICTIVE CAPABILITY FOR SCENARIOS WITHOUT AVAILABLE DATA. THE PROPOSED EFFORT WILL PROVIDE THE NAVY WITH A RADIOMETRICALLY ACCURATE, STATISTICALLY REALISTIC SCENE GENERATION CAPABILITY. AN UNDERSTANDING OF IR BACKGROUND PHENOMENA IS USED TO INTELLIGENTLY COMBINE SYNTHETIC FRACTAL TEXTURING OF KEY PHYSICAL PARAMETERS WITH RELATIVELY FEW RADIANCE COMPUTATIONS TO PROVIDE IMAGES (RADIANCES PER PIXEL) AT PRACTICAL SPEEDS, WITH SPATIAL AND RADIOMETRIC FIDELITY. FURTHER GAINS IN COMPUTATIONAL SPEED STEM FROM AN INNOVATIVE APPROACH TO TEXTURE COMPUTATION. FLEXIBILITY AND FIDELITY ARE ALSO ACHIEVED BY INNOVATIONS IN THE SCENE SPECIFICATION PROCESS, WHEREIN USER SELECTIONS OF SURFACE, ATMOSPHERIC, AND CLOUD CONDITIONS ARE CONSTRAINED TO BE SELF-CONSISTENT.

AIR TURBINE TECHNOLOGY INC
6001 PARK OF COMMERCE BLVD
BOCA RATON, FL 33431
CONTRACT NUMBER: N60530-88-C-0127
JAMES V THEIS
TITLE:
ADVANCED DEVELOPMENT OF A HIGH TEMPERATURE TURBINE DRIVEN
POWER SYSTEM
TOPIC# 173 OFFICE: NWC/NAVAIR IDENT#: 19339

THIS WORK WILL PRODUCE A COMPLETELY INTEGRATED STAND-ALONE POWER SYSTEM WITH CONTROLLABLE OUTPUT FROM 0-12KW TO MEET VARIABLE DEMAND LOADS WITH MINIMUM SPECIFIC FUEL CONSUMPTION. THE HEART OF THIS SYSTEM WILL BE A TURBOALTERNATOR UNDER DEVELOPMENT BY PREVIOUSLY AWARDED PHASE II ACTIVITY AND FURTHER ENHANCED FOR HIGHER TEMPERATURE APPLICATION UNDER THE CURRENT PHASE I CONTRACT PRECEDING THIS PROPOSAL. THE POWER SYSTEM WILL ALSO INCORPORATE THE BENEFITS OF CURRENT PHASE I CONTRACTING BY OTHER COMPANIES TO REFINED FORMULATIONS OF SOLID PROPELLANT FUELS FOR GAS GENERATION TO SUPPLY COMPRESSED WORKING FLUIDS WHICH ARE EXPANDED THROUGH THE TURBINE DRIVE TO PRODUCE SHAFT POWER. A HIGH SPEED ALTERNATOR WILL THEN

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CONVERT THIS POWER TO A RECTIFIED AND REGULATED ELECTRICAL OUTPUT. THE ENTIRE SYSTEM WILL BE AN INTEGRATED, SELF CONTAINED "POWER CELL" CAPABLE OF AUTONOMOUS INSTALLATION IN WEAPONS, VEHICLES, AND SPACECRAFT. ATTENDANT STUDY WILL TARGET ALTERNATE FUELS AND MULTI-FUELED GAS GENERATORS, INCREASED TEMPERATURE LIMITS OF COMPONENTS, INCREASED POWER DENSITY, AND INCREASED POWER TO WEIGHT RATIO.

AMERICAN BIOTECHNOLOGY CO
7658 STANDISH PL - STE 107
ROCKVILLE, MD 20855
CONTRACT NUMBER:
DR PETER E MAXIM

TITLE:
ANTIVIRAL EFFICACY OF BUTYROLACTONE IMMUNOMODULATORS
TOPIC# 4 OFFICE: ONR IDENT#: 17250

THE BUTYROLACTONE (BLs) ARE SYNTHETIC IMMUNOMODULATORS WHICH ARE WATER SOLUBLE, RELATIVELY NON-TOXIC, CARBOHYDRATE COMPOSITIONS, THAT CAN BE ECONOMICALLY PRODUCED IN QUANTITY. THE DRUGS ARE ACTIVE WHEN ADMINISTERED BY ORAL, INTRAVENOUS OR INTRA-PERITONEAL ROUTES. THEY HAVE BEEN SHOWN TO ENHANCE RESPONSIVENESS OF A RANGE OF MURINE T-LYMPHOCYTE DEPENDENT ACTIVITIES IN BOTH NORMAL AND IMMUNOCOMPROMISED ANIMALS. IN ADDITION, SELECT MEMBERS OF THE BLs STIMULATE INNATE IMMUNITY THROUGH ACTIVATION OF NATURAL KILLER (NK) AND POLYMORPHONUCLEAR NEUTROPHILS (PMNs). THIS SPECTRUM OF ACTIVITIES HAS BEEN TRANSLATED INTO PRE-CLINICAL NEUTROPHILS (PMNs). THIS SPECTRUM OF ACTIVITIES HAS BEEN TRANSLATED INTO PRE-CLINICAL RESEARCH IN THE AREAS OF ANTI-VIRAL AND ANTI-BACTERIAL THERAPY. UNDER A PHASE I SBIR THE COMPANY DEMONSTRATED THAT METHYL-FURYL BUTYROLACTONE COULD STIMULATE ANTIVIRAL IMMUNE MECHANISMS OF MICE INFECTED WITH LYMPHOCYTIC CHORIOMENINGITIS VIRUS (LCMV) WITHOUT ENHANCING VIRAL IMMUNOPATHOGENESIS OF THE ACUTE DISEASE. IN FACT, EVIDENCE FOR REDUCTION OF VIRUS YIELDS AND INCREASED SURVIVAL WERE OBSERVED. THE PHASE II PROJECT WILL EXPAND THE ANTIVIRAL STUDIES TO INCLUDE AN ARRAY OF VIRUSES WHICH SIMULATE DIVERSE PATHOGENIC MECHANISMS IN MAN. ALSO, THE COMPANY WILL TEST NEW BLs WHICH REGULATE INNATE AND ACQUIRE IMMUNITY. THE GOAL WILL BE TO CHARACTERIZE ANTIVIRAL EFFICACY OF A BUTYROLACTONE PRODUCT SETTING THE STAGE FOR A PHASE III PROJECT THAT WILL RESULT IN A MARKETABLE FDA APPROVED THERAPEUTIC.

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AMERICAN ELECTRONICS INC
9332 ANNOPLIS RD
LANHAM, MD 20706
CONTRACT NUMBER:
DR PATRICK W JOHNSON
TITLE:
AN ELECTRO-OPTIC AIR TARGET IDENTIFICATION SYSTEM
TOPIC# 105 OFFICE: NAVAIR IDENT#: 16280

IN PHASE I, AMELEX DEMONSTRATED THE FEASIBILITY OF USING VISUAL DATA FROM THE TELEVISION CAMERA SYSTEM (TCS) AND OTHER SYSTEMS CURRENTLY MOUNTED ON NAVY F-14s TO AUTOMATICALLY IDENTIFY NON-COOPERATIVE AIR TARGETS. PHASE II WILL ENTAIL IMPLEMENTATION OF THIS TECHNIQUE IN A PROTOTYPE SYSTEM WHICH WILL PERFORM THE FOLLOWING TASKS IN NEAR-REAL-TIME. IDENTIFY AIR TARGETS USING TAPED DATA TAKEN OF ACTUAL AIRCRAFT; DETECT, TRACK AND IDENTIFY AIR TARGETS USING REAL-TIME DATA PROVIDED BY AN INTEGRAL CCTV CAMERA. THE BASIC SYSTEM WILL BE PASSIVE, REQUIRING ONLY EO DATA, BUT WILL ALSO HAVE AN ACTIVE MODE IN WHICH RADAR AND IFF DATA ARE FUSED WITH THE EO DATA. THE PROTOTYPE WILL BE TRANSPORTABLE TO FACILITATE FIELD TESTING, AND WILL EMPLOY BOTH OFF-THE-SHELF AND CUSTOM BUILD HARDWARE.

ANALYTICS INC
2500 MARYLAND RD
WILLOW GROVE, PA 19090
CONTRACT NUMBER:
STEPHEN W LEIBHOLZ
TITLE:
DATA COMPRESSION FOR NAVAL MESSAGES (ADM/EDM)
TOPIC# 35 OFFICE: NOSC IDENT#: 17761

IN PHASE II, ANALYTICS WILL CONSTRUCT MESSAGE AND TEXT COMPRESSION HARDWARE (MATCH). MATCH WILL UTILIZE ALGORITHMS TO COMPRESS NAVAL MESSAGES. THE ALGORITHMS WERE DEVELOPED AND IMPLEMENTED IN A SOFTWARE ENVIRONMENT IN PHASE I. THE ALGORITHMS USE VARIABLE LENGTH CODES TO REPRESENT CHARACTERS AND CHARACTER STRINGS. AN ANALYSIS OF

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A DATA BASE OF REPRESENTATIVE MESSAGES IS USED TO DETERMINE FREQUENCY OF OCCURENCE OF CHARACTER STRINGS. PHASE II WILL WORK WITH A DATA BASE OF 20,000 VLF MESSAGES TO CONSTRUCT AN OPTIMAL DICTIONARY TO ENCODE THESE MESSAGES. AN ANALYSIS WILL BE CONDUCTED ON THE NOISE LEVEL OF THE VLF CHANNEL, AND APPROPRIATE ERROR DETECTION AND CORRECTION ALGORITHM WILL BE IMPLEMENTED. THE HARDWARE WILL BE DESIGNED TO SUPPORT THESE ALGORITHMS ALONG WITH BEING ABLE TO EASILY BE LOADED WITH NEW DICTIONARIES AND OTHER SOFTWARE UPDATES. AT THE CONCLUSION OF PHASE II ANALYTICS WILL DELIVER MATCH THAT HAS BEEN TESTED IN A LABORATORY AND ALSO IN AN OPERATION ENVIRONMENT. A CONFIGURATION MANAGEMENT PLAN WILL BE DEVELOPED TO SUPPORT MATCH FOR USE IN ANY OPERATIONAL ENVIRONMENT.

ANAMET LABS INC
3400 INVESTMENT BLVD
HAYWARD, CA 94545
CONTRACT NUMBER:
ROCKY RICHARD ARNOLD
TITLE:
METHODOLOGY FOR PREDICTING CANOPY FRACTURING PATTERNS DURING
EJECTION
TOPIC# 193 OFFICE: NADC/NAVAIR IDENT#: 19106

THE PHASE II RESEARCH AND DEVELOPMENT PROPOSED HEREIN ADDRESSES THE NEED TO DETERMINE THE OPTIMUM PLACEMENT OF MILD DETONATING CORD ON AIRCRAFT CANOPIES TO ENSURE THAT DURING EJECTION THE CANOPIES WILL DISINTEGRATE INTO PIECES THAT DO NOT INFLECT INJURY ON THE ESCAPING PILOT. DURING PHASE I, THEORETICAL FORMULATIONS FOR PREDICTING CRACK PROPAGATION AND BRANCHING WERE IMPLEMENTED INTO A COMPUTATIONAL PROGRAM THAT WAS SUBSEQUENTLY SHOWN TO BE APPLICABLE TO THE PROBLEM OF PREDICTING THE FORMATION OF CRACKS, BRANCHES, AND PIECES IN CANOPY STRUCTURES. IN PHASE II, THE FEASIBILITY RESEARCH OF PHASE I WILL BE FURTHER DEVELOPED TO THE POINT THAT THE FINALLY DEVELOPED COMPUTATIONAL PROGRAM CAN BE CONSIDERED A DESIGN TOOL FOR APPLICATION TO CURRENT AND FUTURE AIRCRAFT EJECTION SYSTEMS THAT EMPLOY POLYMERIC MATERIALS.

ATLANTIC APPLIED RESEARCH CORP
4 'A' ST
BURLINGTON, MA 01752
CONTRACT NUMBER:
F R KERN & J W MROSZCZYK
TITLE:
MACHINERY VIBRATION PREDICTION MODEL
TOPIC# 16 OFFICE: ONT/DTRC IDENT#: 15624

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OVER THE LAST 15 YEARS DETAILED METHODS HAVE BEEN DEVELOPED TO PREDICT THE TORSIONAL AND LATERAL VIBRATION OF LOCKED TRAIN PROPULSION GEARS USING LUMPED PARAMETER, DISTRIBUTED MASS-ELASTIC PARAMETER AND STATISTICAL ENERGY ANALYSIS TECHNIQUES. RECENT EMPHASIS ON POD PROPULSION CONCEPTS HAS LED TO THE DEVELOPMENT OF A PRELIMINARY MODEL OF EPICYCLIC GEAR STAGES. THIS MODEL WOULD BE SUBSTANTIALLY UPGRADED TO INCLUDE THE VIBRATION MODES OF INTERNAL COMPONENTS AND INCLUDE METHODS TO PREDICT ADDITIONAL COMPONENTS INCLUDED IN CONTRA-ROTATING SYSTEMS. THE RELATIVE PERFORMANCE BETWEEN EPICYCLIC AND LOCKED TRAIN GEARS WILL BE PREDICTABLE USING SIMILAR MODELING METHODS. THIS MODEL WILL BE DOCUMENTED AND EXPLAIN THE ANALYTICAL MODELS USED TO REPRESENT THE PHYSICAL COMPONENTS OF THE SYSTEM IN TERMS FAMILIAR TO NAVAL ENGINEERS.

ATLANTIC APPLIED RESEARCH CORP
129 MIDDLESEX TURNPIKE
BURLINGTON, MA 01803
CONTRACT NUMBER:
DR FRED R KERN JR
TITLE:
DEVELOPMENT OF SUBMARINE STRUCTURAL VIBRATION TRANSMISSION
MODEL
TOPIC# 234 OFFICE: NOSC/NAVSEA IDENT#: 18284

THE ACTIVE SONARS TYPICALLY USED ON SUBMARINES OPERATE AT FREQUENCIES HIGH ENOUGH TO BE DIFFICULT IF NOT PRESENTLY IMPOSSIBLE TO MODEL ACCURATELY WITH FINITE ELEMENT ANALYSIS. LIKEWISE, CURRENT BEAM AND CYLINDER MODELS PROVIDE INADEQUATE REPRESENTATIONS OF THE HIGH FREQUENCY BEHAVIOR OF PLANE AND FRAME VIBRATIONS. THE AARC STATISTICAL ENERGY ANALYSIS PROGRAM WHICH INCLUDES BENDING, LONGITUDINAL AND TRANSVERSE SHEAR IN-PLANE MODES IS A GOOD MODELING TOOL FOR THE MID-FREQUENCY RANGE OF SONAR SYSTEMS. THE PHASE II WORK WOULD EXTEND THAT RANGE DOWN IN FREQUENCY BY IMPROVING THE REPRESENTATION OF COMPLEX STRUCTURES AND EXTEND THE FREQUENCY RANGE UP BY INCLUDING THICK PLATE EFFECTS. RADIATION MODELS WOULD ALSO BE ADDED WITH ADDITIONAL INPUTS FROM FINITE ELEMENT MODELS AS NEEDED. SINCE SEA MAY BE SOMEWHAT UNFAMILIAR TO SOME USERS, A USERS INSTRUCTION MANUAL IS PROPOSED TO BOTH PROVIDE A REVIEW OF SEA PRINCIPLES AND

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PROVIDE APPLICATION GUIDANCE THROUGH MODELING EXAMPLES.

BATTERY ENGINEERING INC
1636 HYDE PARK AVE
HYDE PARK, MA 02136
CONTRACT NUMBER:
DR CARL SCHLAIKJER
TITLE:
IMPROVED LITHIUM/THIONYL CHLORIDE CELLS USING NEW
ELECTROLYTE SALTS
TOPIC# 87 OFFICE: NAVSEA/NSWC IDENT#: 16914

THE MAIN OBJECTIVE OF THIS EFFORT WILL BE TO IMPROVE THE PERFORMANCE OF LITHIUM/THIONYL CHLORIDE PRIMARY CELLS IN THE SIX AREAS IDENTIFIED AS BEING THE CHIEF NAVY NEEDS FOR IMPROVEMENT SPECIFICALLY IN THESE POWER SOURCES. IN AN EXPLORATORY DEVELOPMENT EFFORT, WOUND C SIZE, HERMETICALLY SEALED CELLS WILL BE USED TO INVESTIGATE WHETHER CHANGES IN THE COMPOSITION OF THE ELECTROLYTE, CATHODE, OR SEPARATOR WILL RESULT IN IMPROVEMENTS IN THE NEEDED AREAS. THESE AREAS INCLUDE VOLTAGE REGULATION, LOW TEMPERATURE PERFORMANCE, RAPID ACTIVATION AFTER STORAGE, BETTER STORAGE CAPABILITY, INCREASED ENERGY OUTPUT, AND SAFETY. THE BASELINE OR CONTROL CELLS WILL BE BUILT IN ACCORDANCE WITH THE CURRENT DESIGN FOR CAPTOR C SIZE CELLS. THE TEST CELLS WILL INCLUDE ELECTROLYTES PREPARED WITH NEW SALTS DISCOVERED DURING THE PHASE I EFFORT, CATHODES PREPARED WITH DIFFERENT CARBONS AND CATALYTIC SUBSTANCES, AND ALTERNATIVE SEPARATOR MATERIALS. THE TEST CONDITIONS WILL INCLUDE FRESH CELLS AND CELLS STORED AT TEMPERATURES AS HIGH AS 71 DEG C. FOR UP TO 90 DAYS AND ACTIVATION AT TEMPERATURES AS LOW AS -30 DEG C. AND RATES AS HIGH AS 10 nA/cm². THE DATA TO BE REPORTED WILL BE THE LOWEST POTENTIAL REACHED DURING ACTIVATION, THE TIME TO RECOVER TO TWO AND TO THREE VOLTS, DISCHARGE PROFILES, AND CAPACITIES TO THREE AND TO TWO VOLTS.

BEND RESEARCH INC
64550 RESEARCH RD
BEND, OR 97701
CONTRACT NUMBER:
RODERICK J RAY
TITLE:
DEVELOPMENT OF A MEMBRANE-BASED COMPRESSED-AIR DEHYDRATOR
TOPIC# 240 OFFICE: DTNSRDC IDENT#: 15934

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THE NAVY NEEDS A RELIABLE, COMPACT, AND ENERGY-EFFICIENT COMPRESSED-AIR DEHYDRATION SYSTEM. DURING THE PHASE I PROGRAM WE DEMONSTRATED THE FEASIBILITY OF USING SYNETHIC MEMBRANES FOR THIS APPLICATION. HOLLOW-FIBER MEMBRANE MODULES WERE DEVELOPED THAT REMOVED WATER VAPOR FROM COMPRESSED-AIR FEED STREAMS AT 125 psig. IN FACT, A HOLLOW-FIBER MODULE WE DELIVERED TO THE NAVY THAT COULD PRODUCE 1.5 SCFM OF DEHYDRATED AIR AT A DEW POINT OF LESS THAN -40 DEG F--AN IMPORTANT FIRST STEP IN MEETING THE PHASE II TARGET OF 30 SCFM AT -40 DEG F. THE DEHYDRATED AIR REPRESENTED 95% OF THE ORIGINAL FEED VOLUME. FOR THE PHASE II PROGRAM WE PROPOSE TO DEVELOP A FULL-SCALE PROTOTYPE HOLLOW-FIBER MODULE FOR DELIVERING 30 SCFM OF DEHYDRATED AIR. TO ACHIEVE THIS GOAL, WE WILL OPTIMIZE THE HOLLOW-FIBER MEMBRANES USED IN THE DEHYDRATIO MODULE. TESTS WILL BE PERFORMED TO DETERMINE THE USEFUL LIFETIME OF THIS NOVEL MEMBRANE-BASED DEHYDRATION SYSTEM. THE MODULES DEVELOPED THE PHASE II PROGRAM WILL BE THE MODELS FOR COMMERCIAL PRODUCTION DURING A SUBSEQUENT PHASE III PROGRAM. A SECONDARY GOAL OF THE PHASE II PROGRAM WILL BE TO INVESTIGATE THE FEASIBILITY OF USING THIS TECHNOLOGY FOR HIGH PRESSURE DEHYDRATION (3000 TO 4500 psi). PRELIMINARY STUDIES INDICATE THAT THE DEHYDRATION MEMBRANES DEVELOPED DURING THE PHASE I PROGRAM, WHEN CONFIGURED TO WITHSTAND HIGH PRESSURES, CAN BE USED FOR THIS APPLICATION.

BEND RESEARCH INC
64550 RESEARCH RD
BEND, OR 97701
CONTRACT NUMBER:
SCOTT B McCRAY

TITLE:

DEVELOPMENT OF FOULING- AND CHLORIDE-RESISTANT REVERSE-OSMOSIS MEMBRANES

TOPIC# 243 OFFICE: DTNSRDC IDENT#: 15976

REVERSE OSMOSIS (RO) IS A PROMISING PROCESS FOR SHIPBOARD PRODUCTION OF POTABLE WATER FROM SEAWATER. HOWEVER, CURRENT RO MEMBRANES ARE DEGRADED BY EXPOSURE TO THE DISINFECTANTS (USUALLY CHLORINE) USED IN THE FEED STREAM. THE DEVELOPMENT OF A CHLORINE-RESISTANT MEMBRANE WOULD LEAD TO A SIMPLER, LESS EXPENSIVE, MORE EFFECTIVE DESALINATION

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SYSTEM. PREVIOUS WORK AT BEND RESEARCH HAS PRODUCED "FIRST GENERATION" CHLORIDE-RESISTANT MEMBRANES THAT CAN MAINTAIN HIGH SALT REJECTIONS WHILE OPERATING ON CHLORINATED FEED STREAMS. HOWEVER, THESE MEMBRANES EXHIBIT EXCESSIVE FLUX DECLINE WHEN EXPOSED TO CHLORIDE. DURING PHASE I OF THIS PROGRAM SOME OF THE POSSIBLE MECHANISMS THAT CAUSE THIS FLUX DECLINE WERE IDENTIFIED. AT THE CONCLUSION OF THE PHASE I PROGRAM, PROGRESS WAS MADE TOWARD THE DEVELOPMENT OF "SECOND GENERATION" MEMBRANES--I.E., MEMBRANES THAT EXHIBIT CONSTANT SALT REJECTIONS AND WATER FLUXES IN THE PRESENCE OF CHLORINATED FEED STREAMS. THE PRIMARY GOAL OF THE PROPOSED PHASE II PROGRAM IS TO REFINE AND OPTIMIZE THE MEMBRANES DEVELOPED DURING THE PHASE I PROGRAM. THESE MEMBRANES WILL BE TESTED ON CHLORINATED AND UNCHLORINATED SEAWATER FEED SOLUTIONS. A SECONDARY GOAL OF THE PROPOSED PROGRAM IS TO INCORPORATE THE CHLORINE-RESISTANT MEMBRANES INTO SPIRAL-WOUND MODULES. THE DEVELOPMENT OF THE CHLORINE-RESISTANT MEMBRANES WILL TAKE PRECEDENCE IN THIS PROGRAM.

BIOSPHERICAL INSTRUMENTS INC
4901 MORENA BLVD - STE 1003
SAN DIEGO, CA 92117
CONTRACT NUMBER: N00014-88-C-0154
CHARLES R BOOTH

TITLE:

MARINE ULTRAVIOLET RADIATION MEASUREMENT INSTRUMENTATION
TOPIC# 2 OFFICE: ONR IDENT#: 17249

THE FIELD OF MARINE PHOTOCHEMISTRY IS A SPECIAL FOCUS AREA FOR ONR AND THE LEADING RESEARCHERS IN THIS AREA HAVE VOICED A STRONG NEED FOR INSTRUMENTATION TO MEASURE THE ATTENUATION OF ULTRAVIOLET LIGHT IN THE OCEAN. BIOSPHERICAL INSTRUMENTS IS THE LEADING DEVELOPER OF NEW TYPE OF OPTICAL OCEANOGRAPHIC SENSORS, AND IS UNIQUELY SUITED TO DEVELOP SENSORS AND INSTRUMENTATION IN THIS AREA OF OCEANOGRAPHY. IN THIS PROPOSAL IS OUTLINED A PLAN FOR THE DEVELOPMENT AND TESTING OF THESE TYPES OF INSTRUMENTATION. PROMISING RESULTS FROM THE PHASE I EFFORT IN DEVELOPING SINGLE WAVELENGTH UV SENSORS WILL BE TESTED IN THE FIELD AGAINST A NEW UV HIGH RESOLUTION SCANNING SPECTRORADIO-METER. THESE RESULTING SENSORS WILL BE FIELD PROVEN AND WELL SUITED TO VERTICAL PROFILING, INCORPORATING A WIDE RANGE DATA ACQUISITION SYSTEM UNDER MICROPROCESSOR CONTROL.

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BIOSPHERICAL INSTRUMENTS INC
4901 MORENA BLVD - STE 1003
SAN DIEGO, CA 92117
CONTRACT NUMBER:
CHARLES R BOOTH
TITLE:
INSTRUMENTATION FOR UNDERSEA VISIBILITY MONITORING
TOPIC# 238 OFFICE: NOSC/NAVSEA IDENT#: 18305

THE PROPOSAL PRESENTS PLANS TO PROVIDE AN OPERATIONAL VISIBILITY MONITORING INSTRUMENT FOR USE UNDERWATER AT LOW LIGHT LEVELS. THE INSTRUMENT WILL USE SOLID STATE PHOTODETECTORS AND WILL PROVIDE A DYNAMIC RANGE OF 10(5) TO 10(-6) FOOT-CANDLES IN CONJUNCTION WITH A 10 cm PATH TRANSMISSOMETER TO MEASURE TWO IMPORTANT PARAMETERS USED IN ESTIMATING TARGET VISIBILITY IN TURBID MEDIA. THE DESIGN WILL MAKE USE OF MICROPROCESSOR BASED DATA ACQUISITION SYSTEMS, BE FULLY BATTERY POWERED, AND PROVIDE A "REAL TIME" GRAPHIC DISPLAY ON A SMALL, RUGGED PACKAGE DESIGNED TO BE USED AT THE SURFACE IN A SMALL BOAT WHILE THE SENSOR ASSEMBLY IS LOWERED. THE OPERATION OF THIS DEVICE IS DESIGNED TO BE EXTREMELY SIMPLE AND HAVE A HIGH RESISTANCE TO IMPROPER OPERATION AND ABUSE. THIS IS THE SECOND PHASE OF THIS DEVELOPMENT EFFORT, CONTINUING AFTER THE SUCCESSFUL OUTCOME OF PHASE I.

CAPE COD RESEARCH INC
PO BOX 600
BUZZARDS BAY, MA 02532
CONTRACT NUMBER:
FRANCIS L KEOHAN
TITLE:
THERMALLY CONDUCTIVE VIBRATION ABSORBING COMPOSITES
TOPIC# 203 OFFICE: NUSC IDENT#: 18251

THE EFFICIENT REMOVAL OF HEAT AND THE DAMPING OF VIBRATIONS FROM SHIPBOARD MACHINERY AND ELECTRICAL EQUIPMENT ARE IMPORTANT FOR CURRENT NAVY OPERATIONS. MATERIALS WITH THE NECESSARY PROPERTIES

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TO PERFORM THESE DIFFERENT FUNCTIONS ARE NOT PRESENTLY AVAILABLE. METALS AND, TO A LESSER EXTENT, CERAMICS ARE THE MATERIALS USED THE MOST FOR CHANNELING HEAT AWAY FROM HOT COMPONENTS. ELASTOMERIC MATERIALS SUCH AS SYNTHETIC RUBBER HAVE THE BEST VIBRATION ABSORBING PROPERTIES. THIS PROPOSAL INVOLVES EXPLORING AN ENTIRELY NEW APPROACH TO THIS PROBLEM WHICH MAY LEAD TO STRUCTURES WHICH CAN BOTH DIMINISH VIBRATIONS AND SERVE AS AN EFFECTIVE THERMAL CONDUCTOR. THE PROPOSED APPROACH IS TO DEVELOP NOVEL GRAPHITE FIBER COMPOSITES BASED ON ELASTOMERIC MATRICES WHICH CAN BE TAILORED TO MEET A VARIETY OF HEAT SINK AND VIBRATION DAMPING APPLICATIONS. IT IS HOPED THAT THE COMBINATION OF HIGHLY CONDUCTIVE GRAPHITE FIBERS AND SYNTHETIC ELASTOMERS WILL PROVIDE NEAR METALLIC THERMAL CONDUCTIVITY AND BROAD RANGE VIBRATION DAMPING CAPABILITY.

CASTLE POINT RESEARCH TECHNOLOGIES
PO BOX 5136 - WASHINGTON ST STA
HOBOKEN, NJ 07030
CONTRACT NUMBER: N00164-87-C-0236
JENNIFER CORDES
TITLE:
A FRACTURE-CRITICAL FAILURE CRITERIA FOR COMPOSITE MATERIALS
TOPIC# 179 OFFICE: NSWC/SSPO IDENT#: 19118

DURING PHASE I, A FRACTURE-CRITICAL ANALYTICAL MODEL WAS DEVELOPED AND TESTED FOR PREDICTION OF FAILURE IN A VARIETY OF COMPONENTS MADE FROM COMPOSITE MATERIALS. THE ANALYTICAL MODEL CREATES A "FICTITIOUS CRACK" REGION ADJACENT TO AN ACTUAL CRACK OR NOTCH, AND USES FINITE ELEMENT ANALYSIS TO PREDICT ACTUAL CRACK INITIATION, CRACK GROWTH, AND ULTIMATE FAILURE OF THE COMPONENT. UNLIKE PREVIOUS APPROACHES, THIS MODEL PREDICTS DIRECTLY THE LOADING CONDITION CAUSING FAILURE IN THE COMPONENT. THE FRACTURE-MECHANICAL MODEL IS FULLY DEVELOPED FOR MODE I (SEPARATION OF CRACK SURFACES) AND MODE II (IN-PLANE SLIDING OF CRACK SURFACES) FRACTURE PROBLEMS. MODEL RESULTS COMPARED FAVORABLY WITH PUBLISHED EXPERIMENTAL RESULTS FOR BOTH FAILURE MODES. THE EXPERIMENTAL DATA REQUIRED TO TEST THE ANALYTICAL MODEL FOR A MORE GENERALIZED CRACK PROBLEM, A MIXED-MODE PROBLEM, WAS NOT AVAILABLE. THE PHASE II GOALS ARE: 1) GENERATE EXPERIMENTAL DATA FOR MIXED-MODE CRACK PROBLEMS, 2) MODIFY THE ANALYTICAL MODE FOR PREDICTION OF FAILURE IN MIXED-MODE CRACK PROBLEMS, AND 3) VERIFY

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THE ACCURACY OF THE MODEL FOR PREDICTING FAILURE IN LAMINATE COMPOSITE STRUCTURES AND CRACKS OR NOTCHES. EXPERIMENTAL DATA WILL BE GENERATED FOR PLATES AND BEAMS MADE OF GRAPHITE/ALUMINUM AND GLASS/EPOXY COMPOSITES. LOADING CONDITIONS WILL INCLUDE AXIAL AND BI-AXIAL TENSION.

CENTRA TECHNOLOGY INC
3204 MONROE ST - STE 300
ROCKVILLE, MD 20852
CONTRACT NUMBER: N00024-89-C-3862
JON S HOYLE
TITLE:
SHIPBOARD APPLICATION OF LOW ANGLE MMW TRACK RADAR
TOPIC# 72 OFFICE: NAVSEA IDENT#: 16500

CENTRA TECHNOLOGY INC. PROPOSES A PHASE II SBIR EFFORT TO INVESTIGATE THE POTENTIAL OF MILLIMETER WAVE, MMW, TRACK RADARS TO ACCURATELY TRACK AND SUPPORT THE ENGAGEMENT OF LOW FLYING TARGETS. A PHASE I STUDY (TOPIC N87-72, "USE OF MILLIMETER WAVE TECHNOLOGY IN NAVAL SHIPBORNE RADAR APPLICATIONS," CONTRACT N00024-88-C-5126) SHOWED THAT MMW TRACK RADARS OFFER SIGNIFICANT POTENTIAL TO IMPROVE THE ABILITY OF SHIPBOARD WEAPONS SYSTEMS TO COUNTER LOW FLYING TARGETS. HOWEVER, PHASE I ALSO UNCOVERED SEVERAL ISSUES WHICH BEAR ON ACHIEVABLE TRACK ACCURACIES. IN PARTICULAR, THE EFFECTS OF MULTIPATH, PROPAGATION, CLUTTER, AND TRACKING TECHNIQUES ARE CRITICAL. THESE DOMINATE TRACK ERRORS ON LOW FLYERS AND PLAY A LARGE ROLE IN DETERMINING THE COMPLEXITY OF THE WEAPON USED TO ENGAGE THE TARGET. THESE EFFECTS WILL BE INVESTIGATED IN DETAIL AND ADVANCED MMW TRACK RADARS AND WEAPONS SYSTEMS CONCEPTS WILL BE DESIGNED AND EVALUATED IN PHASE II. THE ABILITY OF DIFFERENTIAL TRACKING TO REDUCE TRACK BIASES AND ERRORS CAUSED BY MULTIPATH WILL BE DETERMINED THROUGH ANALYSIS AND SIMULATION. A PRIMARY OBJECTIVE WILL BE TO DEVELOP AN ADVANCED TRACKING STRATEGY TO PROVIDE CONTINUOUS TRACK ON LOW FLYERS INSIDE 8 nmi WITH TRACK ACCURACY BETTER THAN 0.2 mrad AT A RANGE OF 3 nmi FOR TARGET HEIGHTS DOWN TO 4 FT.

CERAMATEC INC (OLD: ADV CERAMICS RES)
2425 S 900RD W
SALT LAKE CITY, UT 84119
CONTRACT NUMBER:
DAVID W RICHERSON
TITLE:
HYPERSONIC RAMJET LEADING EDGE MATERIALS DEVELOPMENT
TOPIC# 137 OFFICE: NSWC IDENT#: 17777

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THE OBJECTIVE OF THE PHASE II PROGRAM IS TO DEVELOP A STRONG, TOUGH CERAMIC MATRIX COMPOSITE THAT CAN OPERATE IN A HIGH TEMPERATURE OXIDIZING ENVIRONMENT WITH A MINIMUM OF DEGRADATION. FURTHERMORE, THE COMPOSITE MUST WITHSTAND SEVERE THERMAL SHOCK AND HIGH VELOCITY PARTICLE OR LIQUID DROPLET IMPINGEMENT. THE APPROACH IS TO REINFORCE A DIBORIDE-BASED MATRIX WITH CONTINUOUS FIBERS OF SiC OR CARBON. THE EFFORT WILL BE AN EXTENSION OF PHASE I WHERE A TOUGH COMPOSITE WITH A ROOM TEMPERATURE STRENGTH OF 1200 MPa (175,000 psi) WAS ACHIEVED. THE PROGRAM TASKS WILL INCLUDE CHARACTERIZATION OF PROPERTIES VERSUS TEMPERATURE FOR THE BASELINE MATERIAL, USE OF RESULTING INFORMATION TO GUIDE FURTHER COMPOSITION AND THE MICROSTRUCTURAL OPTIMIZATION, AND DETAILED CHARACTERIZATION OF THE FINAL OPTIMIZED COMPOSITE.

CHOPP COMPUTER CORP
1012 PROSPECT ST - #300
LA JOLLA, CA 92037
CONTRACT NUMBER: N60921-90-C-0049
LEE HIGBIE
TITLE:
DESIGN AND TECHNOLOGY TRANSFER OF THE CHOPP DOMAIN
ADAPTABLE SCALABLE PARALLEL ARCHITECTURE
TOPIC# 159 OFFICE: NSWC IDENT#: 17802

THE PHASE I STUDY SHOWED THAT A NEW SINGLE PARALLEL COMPUTER OF UNIQUE DESIGN, THE CHOPP DASPA, CAN PROVIDE OUTSTANDING PERFORMANCE FOR ALL THREE APPLICATION DOMAINS OF IMPORTANCE IN MILITARY MISSIONS - NAMELY, NUMERICAL ANALYSIS, SYMBOLIC PROCESSING AND REAL TIME COMPUTING. THESE THREE APPLICATION DOMAINS ARE CURRENTLY SUPPORTED BY A HETEROGENEOUS COLLECTION OF GENERAL PURPOSE AND SPECIAL PURPOSE COMPUTERS WHICH COLLECTIVELY DO NOT YET MEET THE PROJECTED PERFORMANCE LEVELS REQUIRED FOR FUTURE SYSTEMS. THUS, WE HAVE SHOWN THAT A CLUSTER OF IDENTICAL CHOPP DASPA COMPUTERS SOLVES MANY OF THE PROBLEMS OF THE NEXT GENERATION COMPUTER RESOURCE PROGRAM WITHOUT SACRIFICING ANY OF ITS BENEFITS. THE PHASE II EFFORT WILL ACCOMPLISH DETAILED DESIGN OF THE COMPUTER SYSTEM, DETAILED VERIFICATION OF ITS PERFORMANCE FOR TYPICAL MISSION MODELS, AND TECHNOLOGY TRANSFER TO NAVY SYSTEM LABORATORIES AND INTERESTED

SUBMITTED BY

MILITARY VENDORS.

COMPUTER COMMAND & CONTROL CO
2401 WALNUT ST - STE 402
PHILADELPHIA, PA 19103

CONTRACT NUMBER:

EVAN LOCK

TITLE:

SOFTWARE ENGINEERING ENVIRONMENT FOR PARALLEL/DISTRIBUTED
SYSTEMS

TOPIC# 158 OFFICE: NSWC IDENT#: 17800

WE PROPOSE TO DEVELOP A SYSTEM CALLED DISTRIBUTED CONFIGURATOR THAT WILL MAKE IT VERY EASY FOR A USER TO DEVELOP, TEST AND EXECUTE PARALLEL/CONCURRENT PROGRAMS ON A COMPUTER NETWORK COMPRISED OF A NUMBER OF CPU'S CONNECTED BY COMMUNICATIONS. THE MAIN INNOVATIONS ARE IN: 1) SYNTHESIS THE THREE AREAS OF MAN-MACHINE COMMUNICATIONS, SOFTWARE ENGINEERING AND DISTRIBUTED OPERATING SYSTEMS, AND 2) DYNAMIC RECONFIGURATION BASED ON FLOW OF DATA BETWEEN COMPUTER ENTITIES. THE SYSTEM IS COMPRISED OF TWO PARTS: 1) A PROGRAM GENERATOR USES GRAPHICS TO SOLICIT FROM THE USER A DATAFLOW-LIKE DIAGRAM OF THE PARALLEL/CONCURRENT ENTITIES AND THEIR INTERCONNECTIONS; IT ANALYZES THE USER'S INPUT FOR LOGICAL CORRECTNESS AND GENERATES COMMAND PROGRAMS FOR ESTABLISHING COMMUNICATIONS AND EXECUTION. 2) EXTENSIONS TO EACH LOCAL OPERATING SYSTEM TO CONTROL COMMUNICATIONS AND EXECUTION AND TO PROVIDE RUN-TIME INFORMATION FOR DEBUGGING, OPTIMIZING LOAD BALANCING AND ENFORCING PRIORITY OF MESSAGES. THE SYSTEM WILL HANDLE HETEROGENEOUS PROCESSORS AND SOFTWARE SYSTEMS: VMS, ULTRIX FOR DIGITAL VAX, UNIX FOR SUN AND APOLLO AND AIX FOR IBM RT, AND DISTRIBUTED DATABASES AND GRAPHICS.

CONAX BUFFALO CORP

2300 WALDEN AVE

BUFFALO, NY 14225

CONTRACT NUMBER:

DR GEORGE W TREGAY

TITLE:

HIGH PRESSURE OPTICAL PENETRATOR FOR SINGLE MODE FIBER

TOPIC# 236 OFFICE: NOSC/NAVSEA IDENT#: 18300

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CONAX HAS EXTENDED THE EXPERIENCE GAINED IN 14 YEARS OF ENGINEERING AND MANUFACTURING ELECTRICAL PENETRATORS TO SEALING DEVICES FOR FIBER OPTICS. PHASE I DEMONSTRATED FIBER OPTIC SEALS WITH LESS THAN 0.15db LOSS AT 10,000 psi AND AN INSERTION LOSS OF 1db FOR A PENETRATOR WITH CONNECTORS. PHASE II WILL DEVELOP A PENETRATOR WITH A WIDER TEMPERATURE RANGE. EXTENSIVE ENVIRONMENTAL TESTING INCLUDES SIMULTANEOUS MEASUREMENT OF INSERTION LOSS AT PRESSURE OVER THE RANGE OF SEAWATER TEMPERATURE. THE KEY PERFORMANCE OBJECTIVES ARE: COMPRESSIVE SEALING - 10,000 psi PRESSURE DIFFERENTIAL WITH TOTAL INSERTION LOSS OF LESS THAN 2db RELATIVE TO A SHORT REFERENCE CABLE WITH EQUIVALENT CONNECTORS. DURABILITY - OPERATES FOR 1,000 HOURS AT 10,000 psi. TEMPERATURE RANGE - THE PENETRATOR WILL OPERATE FROM 0 TO 70 DEGREES C. NINE PENETRATORS WILL BE FABRICATED USING THREE DESIGN CONCEPTS. ENVIRONMENTAL TESTING WILL BE USED TO SELECT THE BEST DESIGN, AND EIGHT PENETRATORS OF THIS STYLE WILL BE FABRICATED FOR DELIVERY TO THE NAVY.

CONCEPTS ETI INC
PO BOX 643 - MAIN ST
NORWICH, VT 05055

CONTRACT NUMBER:

DR DAVID JAPIKSE

TITLE:

REDUCED DIAMETER CENTRIFUGAL COMPRESSOR DIFFUSER INVESTIGATION

TOPIC# 226 OFFICE: NAPC/NAVAIR IDENT#: 19992

THE APPLICATION OF A BENT DIFFUSER DESIGN PHILOSOPHY TO A LOW FRONTAL AREA AIRCRAFT CENTRIFUGAL COMPRESSOR STAGE CAN NOW BE PURSUED SERIOUSLY. PHASE I WORK HAS SHOWN THAT A BEND CAN BE INTRODUCED INTO A CENTRIFUGAL COMPRESSOR DIFFUSION SYSTEM WITH NEGLIGIBLE IMPACT ON PERFORMANCE. FURTHER WORK IS REQUIRED TO ESTABLISH A SYSTEMATIC DESIGN METHODOLOGY AND TO ADAPT THE DESIGN PHILOSOPHY TO DIFFERENT APPLICATIONS. A SERIES OF DEVELOPMENT EVALUATIONS ARE PROPOSED TO PROVIDE SYSTEMATIC CRITERIA FOR EACH ELEMENT OF THE DIFFUSION SYSTEM WHILE EMPHASIZING THE OVERALL DIFFUSION SYSTEM OPTIMIZATION. UPON COMPLETION OF THE TECHNOLOGY DEVELOPMENT TEST SERIES, A LARGER TEST RIG EVALUATION WILL BE MADE, BASED ON A MODEL OF THE INTENDED AIRCRAFT ENGINE. DEVELOPMENT WORK

SUBMITTED BY

MAY STILL OCCUR AT THIS POINT. WHEN ALL DEVELOPMENTAL STUDIES ARE COMPLETED, A DEMONSTRATION ON A FULL-SIZED RIG OR ACTUAL DEMONSTRATOR ENGINE WITH THE DESIGNATED ENGINE MANUFACTURER WILL BE EXECUTED. CONSIDERATION HAS BEEN GIVEN TO PHASE III WORK WHERE THE RESULTING TECHNIQUES WILL BE SHOWN AND TAUGHT THROUGH THE AIRCRAFT ENGINE INDUSTRY.

CRYSTAL SYSTEMS INC
27 CONGRESS ST
SALEM, MA 01970
CONTRACT NUMBER:
CHANDRA P KHATTAK
TITLE:
GROWTH OF HIGH OPTICAL QUALITY BaTiO(3) PHOTOREFRACTIVE
SINGLE CRYSTALS
TOPIC# 139 OFFICE: NSWC IDENT#: 17779

PHOTOREFRACTIVE BaTiO(3) CRYSTALS FOR PHASE CONJUGATION (PC) AND FOUR-WAVE MIXING (FWM) CANNOT BE FULLY EXPLORED BECAUSE OF LACK OF AVAILABILITY OF LARGE CRYSTALS WITH HIGH OPTICAL QUALITY. THE FEASIBILITY OF GROWING BULK BaTiO(3) CRYSTALS FROM BaB(2)O(4) FLUX USING THE HEAT EXCHANGER METHOD (HEM[tm]) WAS ESTABLISHED USING SMALL CHARGE SIZES DURING THE PHASE I PROGRAM. THIS IS THE FIRST TIME A DETAILED INVESTIGATION OF BaTiO(3) CRYSTAL GROWTH HAS BEEN MADE USING BaB(2)O(4) FLUX. BULK CRYSTALS WITH THE LARGEST DIMENSION OF ABOUT 2 mm WERE GROWN. THE BACKGROUND LEVEL OF IMPURITIES WAS AT LEAST AS GOOD AS COMMERCIALY AVAILABLE BaTiO(3) CRYSTALS. THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO GROW BULK BaTiO(3) CRYSTALS WITH A MAXIMUM DIMENSION OF APPROXIMATELY 2 cm, SIGNIFICANTLY LARGER THAN 5 mm SIZE OF COMMERCIAL AVAILABLE CRYSTALS. IT IS INTENDED TO EMPHASIZE MINIMIZATION OF NUCLEATION SITES AND OPTIMIZE CRYSTAL GROWTH PARAMETERS WITH LARGER SIZE CHARGES. INVESTIGATIONS WILL ALSO BE MADE IN OPTIMIZATION FOR PHOTOREFRACTIVE PROPERTIES. AT THE END OF THE PROPOSED PROGRAM IT IS EXPECTED THAT TECHNOLOGY IS IN PLACE FOR PRODUCING LARGER HIGH QUALITY CRYSTALS NOT CURRENTLY AVAILABLE FOR PHOTOREFRACTIVE APPLICATIONS.

CRYSTAL SYSTEMS INC
27 CONGRESS ST - SHETLAND INDUSTRIAL PK
SALEM, MA 01970
CONTRACT NUMBER: N60530-88-C-0076
CHANDRA P KHATTAK
TITLE:
GROWTH OF NEAR NET-SHAPED SAPPHIRE DOMES USING THE HEAT EXCHANGER METHOD
TOPIC# 171 OFFICE: NWC/NAVAIR IDENT#: 19330

SUBMITTED BY

SAPPHIRE IS ONE OF THE BEST MATERIALS FOR MISSILE DOME APPLICATIONS. HOWEVER, NO U.S. OR NATO MISSILE PRODUCTION PROGRAMS ARE USING SAPPHIRE DOMES BECAUSE OF HIGH MATERIAL AND FABRICATION COSTS. IT IS THEREFORE NECESSARY TO GROW NEAR NET-SHAPED SAPPHIRE DOMES FOR MISSILE APPLICATIONS. PREVIOUS WORK PRODUCING NEAR NET-SHAPED DOMES DIRECTLY FROM THE MELT USING THE HEAT EXCHANGER METHOD (HEM) SHOWED THAT DOME-SHAPED BLANKS COULD BE PRODUCED BY NESTING MOLYBDENUM PREFORMS. IT WAS OBSERVED THAT THESE BLANKS CRACKED AFTER SOLIDIFICATION. DURING THE PHASE I PROGRAM IT HAS BEEN SHOWN THAT CRACK-FREE DOME-SHAPED SAPPHIRE BLANKS CAN BE PRODUCED DIRECTLY FROM THE MELT. THESE BLANKS ARE OF HIGH OPTICAL QUALITY AS REQUIRED FOR DOME APPLICATIONS. THE SURFACE QUALITY OF AS-GROWN NEAR NET-SHAPED DOME BLANKS IS SUPERIOR TO BLANKS PRODUCED BY SCOOPING. THE HIGH OPTICAL QUALITY, HIGH SURFACE QUALITY AND (0001) ORIENTATION OF THESE NEAR NET-SHAPED DOME BLANKS COULD BE UTILIZED TO PRODUCE HIGH-QUALITY FINISHED DOMES FOR DUAL MODE SENSING SYSTEMS. THE OBJECTIVE OF THE PHASE II PROGRAMS ARE TO DEVELOP EXPERIMENTAL TECHNIQUES USED IN PHASE I PROGRAM AND TO ESTABLISH TECHNOLOGY FOR HEM PRODUCTION OF NEAR NET-SHAPED SAPPHIRE DOME BLANKS DIRECTLY FROM THE MELT TO SPECIFICATIONS REQUIRED FOR A U.S. MISSILE SYSTEM.

DECEL INC
1665 LEXINGTON AVE - STE #105
DeLAND, FL 32720
CONTRACT NUMBER: M00027-88-C-0069
RICHARD C EMERSON
TITLE:
VARIABLE SPEED COMPATIBLE REFUELING DROGUE FOR REFUELING
FIXED/ROTOR WING AIRCRAFT
TOPIC# 23 OFFICE: MARCORPS IDENT#: 15874

STUDY TO DEVELOP A RETROFIT FOR SEPARATE DROGUES USED FOR HELICOPTERS AND HIGH SPEED AIRCRAFT. PHASE I WAS DESIGN AND TEST OF A VARIABLE Q (VQ) DRAGUE. PHASE II WILL BE REFINEMENT OF DESIGN FOR OPTIMUM, FABRICATION OF COMPLETE UNITS FOR TEST BY USMC AND PRODUCTION OF FINAL DRAWINGS AND SPECIFICATIONS FOR PHASE III.

DECISION SCIENCE CONSORTIUM INC
1895 PRESTON WHITE DR - STE 300
RESTON, VA 22091
CONTRACT NUMBER:
DR JACOB W ULVILA
TITLE:
COMPUTERIZED DECISION SUPPORT FOR RESOURCE ALLOCATION
TOPIC# 253 OFFICE: NAVAIR/NATC IDENT#: 17683

SUBMITTED BY

THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO DEVELOP, DELIVER, AND IMPLEMENT A CUSTOMIZED COMPUTER MODEL FOR USE IN RESOURCE ALLOCATION DECISION MAKING IN NATC'S RDT&E ENVIRONMENT. BUILDING ON THE RESULTS OF PHASE I, WHERE WE CHARACTERIZED NATC'S RDT&E RESOURCE ALLOCATION PROCESS, DEVELOPED METHODS FOR RESOURCE ALLOCATION, AND DEMONSTRATED THE METHODS IN A SOFTWARE PROTOTYPE, WE WILL CONDUCT PHASE II ACCORDING TO THE FOLLOWING TASKS. IN TASK 1, WE WILL DEVELOP METHODS TO ADDRESS COMPLICATING FACTORS IN NATC'S RESOURCE ALLOCATION. IN TASK 2, WE WILL APPLY THE METHODS IN A FULL-SCALE DEMONSTRATION. IN TASK 3, WE WILL ADD CAPABILITIES TO THE SOFTWARE PROTOTYPE DEVELOPED IN PHASE I, TURNING IT INTO A PROGRAM ALLOCATION EXECUTIVE (PAX) COMPUTER PROGRAM. TASKS 1, 2, AND 3 ARE OFFERED AS THE BASIC PROPOSAL. IF THE OPTIONAL PROPOSAL IS SELECTED, WE WILL ADD TASKS 4 AND 5. IN TASK 4, WE WILL PROVIDE IMPLEMENTATION SUPPORT TO INTEGRATE THE METHODS INTO NATC'S RDT&S DECISION MAKING. IN TASK 5, WE WILL COMPLETE DEVELOPMENT AND DELIVERY OF THE PAX COMPUTER PROGRAM, ADDING FEATURES AND DOCUMENTATION. IN PHASE 3, WE WILL PURSUE COMMERCIALIZATION OF THE PHASE 2 PRODUCTS.

DELTA TECHNOLOGY SYSTEMS (SUB OF LME)

444 JACKSONVILLE RD
WARMINSTER, PA 18974

CONTRACT NUMBER:

W BARRY SHOPE

TITLE:

CONTROLLING SEVERED HELICOPTER BLADES DURING EMERGENCY ESCAPE

TOPIC# 189 OFFICE: NADC/NAVAIR IDENT#: 19077

IT IS PROPOSED AS A RESULT OF THE INITIAL PHASE I STUDY THAT A CONTINUATION OF THE PROJECT BE APPROVED IN ORDER TO FURTHER DEVELOP AND REFINE THE OPERABILITY, CONTROLLABILITY AND RELIABILITY OF THE BLADE DECELERATOR SUBSYSTEM. PARTICULAR EMPHASIS WILL BE FOCUSED ON DESIGN AND PERFORMANCE REFINEMENT, RETROFIT, AND INTEGRATION ONTO AN AH-1W HELICOPTER. INCLUDED IN THESE EFFORTS WILL BE COMPATIBILITY OF THE DESIGN TO ALL MODES OF TRANSPORT AND SERVICE ENVIRONMENTS IN ALL GLOBAL CONDITIONS. THE OUTPUT OF THIS WORK PLAN HAS BEEN FORMULATED TO OCCUR IN A LOGICAL SEQUENCE OF EVENTS. THESE EVENTS WILL REFINE AND QUANTIFY THE PHASE I METHODOLOGY IN ADDITION

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TO CONSTRUCTING A QUALITY BASE OF ENGINEERING AND STATISTICAL DATA FOR FUTURE NAVY USE. HARDWARE FABRICATION AND EVALUATION WILL PROVIDE HANDS-ON ARTICLES TO DEMONSTRATE SYSTEM COMPATIBILITY.

DISPLAYTECH INC
2200 CENTRAL AVE - STE C
BOULDER, CO 80301
CONTRACT NUMBER: N60921-90-C-0079
MARK HANDSCHY
TITLE:
PHOTOADDRESSED SPATIAL LIGHT MODULATORS USING FERROELECTRIC LIQUID CRYSTALS
TOPIC# 144 OFFICE: NSWC IDENT#: 17785

THE PROPOSED WORK AIMS TO DEVELOP NOVEL, HIGH-PERFORMANCE SPATIAL LIGHT MODULATORS (SLMs) BY JOINING FERROELECTRIC LIQUID CRYSTALS (FLCs) WITH HYDROGENATED AMORPHOUS SILICON (a-Si:H). FLCs BRING INTO ADVANTAGES OF A FAST, (us), LOW VOLTAGE (10 V), LOW-POWER (uW/cm2) LIGHT MODULATING MATERIAL, WHILE a-Si:H BRINGS THE ADVANTAGES OF A FAST (us), HIGH RESOLUTION (HUNDREDS OF lp/mm), SENSITIVE PHOTODIODE. SLMs COMBINING THESE MATERIALS WERE DEMONSTRATED DURING PHASE I. DURING PHASE II, OPTIMIZATION OF BOTH THE FLC AND a-Si:H WILL BE UNDERTAKEN, ALONG WITH THE DESIGN AND FABRICATION OF COMPLETE SLMs. TARGET PERFORMANCE LEVELS INCLUDE 20 kHz FRAME RATE, AND 100 lp/mm RESOLUTION, ALL AT LESS THAN 1.5 uJ/cm2 OPTICAL WRITING ENERGY.

DISPLAYTECH INC
2200 CENTRAL AVE - STE C
BOULDER, CO 80301
CONTRACT NUMBER: N00163-89-C-0137
MARK HANDSCHY
TITLE:
FAST FIBER OPTIC SWITCH USING FERROELECTRIC LIQUID CRYSTALS
TOPIC# 250 OFFICE: NAC/NAVAIR IDENT#: 19406

THE PHASE II WILL CONTINUE THE SUCCESSFUL WORK DONE IN PHASE I WITH

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ELECTRO OPTIC SWITCH FOR USE WITH MULTIMODE OPTICAL FILTERS.

EIC LABS INC
111 DOWNEY ST
NORWOOD, MA 02062
CONTRACT NUMBER:
DR MICHAEL M CARRABBA

TITLE:
REMOTE FIBER OPTIC SENSOR FOR GASEOUS AND LIQUID ENVIRONMENT
BASED ON SURFACE ENHANCED RAMA SPECTROSCOPY (SERS)
TOPIC# 263 OFFICE: ONR IDENT#: 17255

THERE IS A UNIVERSAL NEED WITHIN THE DEFENSE-RELATED OPERATIONS FOR CHEMICAL SENSING. IN MOST CASES, THE FAVORABLE CONFIGURATION OF A SENSOR WOULD BE ONE IN WHICH THE DETECTOR (I.E., PROBE) WOULD OPERATE IN SITU AND PRODUCE INFORMATION ON CHEMICAL COMPOSITION IN REAL TIME WITH A HIGH LEVEL OF SENSITIVITY (ppb OR LESS). IT IS THE GOAL OF THE PROPOSED WORK TO DEVELOP A "UNIVERSAL" REMOTE SENSOR FOR ORGANIC AND INORGANIC COMPOUNDS IN BOTH THE GASEOUS AND LIQUID ENVIRONMENT. THE PROPOSED SENSOR WOULD BE BASED ON SURFACE ENHANCED RAMA SPECTROSCOPY (SERS). THE SERS SIGNAL, WHICH CORRESPONDS TO VIBRATIONAL SPECTRA OF A MOLECULE ABSORBED ONTO A ROUGHENED METAL SUBSTRATE, IS OBTAINED FROM THE RAMAN SCATTERING OFF THE SUBSTRATE USING A VISIBLE LASER SOURCE. REMOTE SENSING WILL BE ACHIEVED USING OPTICAL FIBERS FOR EXCITING THE METAL SUBSTRATE, CONTAINED IN A PROBLEM HEAD, AND FOR RETURNING THE SCATTERED LIGHT TO THE DETECTOR. PHASE I RESULTS HAVE DEMONSTRATED THAT SERS CAN BE USED AS A GAS PHASE SENSOR FOR ORGANIC VAPORS OR MIXTURES OF ORGANIC VAPORS. THE GOAL OF THE PHASE II PROGRAM IS TO DEVELOP A FIBER OPTIC BASED SERS INSTRUMENTATION THAT IS SELECTIVE, SENSITIVE AND FIELDABLE.

ELECTRO MAGNETIC APPLICATIONS INC
PO BOX 8482
ALBUQUERQUE, NM 87198
CONTRACT NUMBER:
T H LEHMAN
TITLE:
NON-LINEAR PHASED ARRAY HIGH POWER MICROWAVE SOURCE
TOPIC# 33 OFFICE: NOSC IDENT#: 17759

SUBMITTED BY

DURING PHASE I, IT WAS FOUND TO BE FEASIBLE TO CONSTRUCT A NON-LINEAR PHASED ARRAY SOURCE THAT WILL PRODUCE LEVELS OF RF ENERGY THAT CAN DAMAGE OR UPSET UNPROTECTED ELECTRONIC EQUIPMENT AT A RANGE OF ONE KILOMETER. THIS SOURCE, WHICH CAN BE CONSTRUCTED USING OFF-THE-SHELF COMPONENTS, OPERATES IN THE UHF BAND WHICH IS THE FREQUENCY RANGE MOST LIKELY TO CAUSE PERMANENT DAMAGE AND DISRUPTION OF DIGITAL ELECTRONIC EQUIPMENT ABOARD MISSILES, SHIPS AND AIRCRAFT. DURING PHASE II, WE PROPOSE TO CONTINUE THE DEVELOPMENT OF THIS SOURCE BY DOING DESIGN IMPROVEMENTS AND DETAILED DESIGN OF THE ANTENNA ARRAY, THE SWITCHING NETWORK, AND THE HIGH VOLTAGE POWER SYSTEM. ADDITIONALLY, PART OF THE ARRAY WILL BE CONSTRUCTED AND USED TO VERIFY THE PREDICTED ARRAY PERFORMANCE CHARACTERISTICS. AT THE COMPLETION OF PHASE II, THE DESIGN OF THE HIGH POWER SOURCE WILL BE COMPLETE. A COMPLETE HIGH POWER SYSTEM CAN BE BUILT AND EVALUATED UNDER THE PHASE III EFFORT.

ELECTRO-OPTEK CORP
3152 KASHIWA ST
TORRANCE, CA 90505
CONTRACT NUMBER: N60921-90-C-0005
WILLIAM S CHAN
TITLE:
MULTICOLOR PbsSe ARRAY
TOPIC# 131 OFFICE: NSWC

IDENT#: 17770

AN INVESTIGATION ON THE MOLECULAR BEAM EPITAXY (MBE) GROWTH OF PbsSe THIN-FILM EPILAYERS AND MULTILAYERED DETECTOR STRUCTURES HAS BEEN MADE, AIMED AT FABRICATING PRODUCIBLE MULTICOLOR DETECTOR ARRAYS COVERING THE SPECTRAL RANGE OF 2-5 MICRONS. THE FIRST PHASE OF THIS INVESTIGATION HAS ACHIEVED THE FOLLOWING ACCOMPLISHMENTS: (1) THE SCHOTTKY BARRIER STRUCTURES OF THE Pbs AND PbsSe HAVE BEEN FOUND AMENABLE TO MBE GROWTH; (2) SEVERAL CRYSTALLINE SUBSTRATES HAVE BEEN IDENTIFIED FOR EPITAXY; (3) SPECIAL DESIGNS OF MBE GUNS AND FIXTURES NEEDED FOR EPITAXY HAVE BEEN COMPATIBLE TO CONVENTIONAL MBE TECHNIQUES; (4) THE REQUIRED MBE PROCESSES HAVE BEEN DELINEATED AND MADE AMENABLE TO ESTABLISHED MBE PROCEDURES; AND (5) THE MULTICOLOR LINEAR ARRAY STRUCTURES HAVE BEEN DESIGNED FOR FABRICATION BY THE SAME MBE PROCESS. A PROPOSED PLAN FOR CONDUCTING PHASE II OF THIS

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PROGRAM HAS BEEN MADE TO INCLUDE THE KEY ELEMENTS OF MBE TOOLING FOR EPITAXY, SUBSTRATE BUFFERING FOR EPITAXIAL GROWTH, IN-SITU DOPING AND METALIZATION FOR SCHOTTKY BARRIER FORMATION AND ELECTRICAL TESTING OF THE RESULTANT DEVICE STRUCTURES.

ELECTRO-RADIATION INC
39 PLYMOUTH ST
FAIRFIELD, NJ 07006
CONTRACT NUMBER:
RONALD P OLIN
TITLE:
MULTIPOINT TARGET RADIO FREQUENCY AUGMENTATION
TOPIC# 216 OFFICE: PMTC/NAVAIR IDENT#: 19071

THE PROGRAM DEVELOPS AN APPROACH FOR RADAR SIGNATURE ENHANCEMENT OF TARGETS USING MULTIPOINT OPEN-LOOP RF AUGMENTATION. THE PROTOTYPE DESIGN IMPLEMENTS TARGET GAIN, FADE/SCINTILLATION AND DOPPLER CAPABILITIES, AND PRODUCES INDUCE ANGLE GLINT AND POLARIZATION TRACKING PHENOMENA. THE PROJECT DEVELOPS HARDWARE AND SOFTWARE UTILIZING RF, POWER SUPPLY, AND INTERFACEDESIGNS IN AN AIR COOLED ENCLOSURE, WITH CONTROL HARDWARE AND SOFTWARE IN A PC. THE CONTROL UTILIZES A PC, NDI INTERFACE BOARDS, LABORATORY INSTRUMENTS, A TEST UNIT, AND HOL SOFTWARE FOR CONTROL AND SIGNAL GENERATION. SOFTWARE INCLUDES COMPONENT TEST AND INTEGRATION SOFTWARE FOR DEVELOPMENT, AND CONTROL SOFTWARE FOR TEST. THE PROTOTYPE IMPLEMENTS A 9-10.5 GHz COHERENT REPEATER USING A 2-4 GHz IF CHANNEL. THE DESIGN USES DUAL SOURCE TECHNIQUES AND MATCHED SOLID STATE OUTPUT AMPLIFIERS WITH A +31 dBm LINEAR OUTPUT. THE SYSTEM CONTROLS RELATIVE AMPLITUDE AND PHASE, AND TRANSMITS USING ORTHOGONAL ANTENNAS TO SYNTHESIZE AND CONTROL POLARIZATION. DOPPLER IS APPLIED USING QUADRATURE LO MODULATION. CRITICAL MODULATIONS ARE IMPLEMENTED AT IF WITH THE CHAIN DESIGNED TO PRESERVE LINEARITY AND PRECISION DURING COMPRESSION. GAIN BALANCE AND TEMPERATURE COMPENSATION ARE USED TO ACHIEVE MATCHING PRECISION. COMPONENT TEMPERATURES ARE MAINTAINED FOR LABORATORY AND SUBSONIC AIRBORNE ENVIRONMENTS USING A PACKAGE WHERE COMPONENTS AND MODULES ARE MOUNTED TO A CENTRAL PLENUM. THE PROTOTYPE OPERATES IN A 0 DEG TO 85 DEG C AMBIENT ENVIRONMENT.

ENFITEK INC
502 SLIDE RD - #1811
LUBBOCK, TX 79416
CONTRACT NUMBER: N60530-88-C-0028
ALBERT G ENGELHARDT
TITLE:
CONCEPTS FOR AN INNOVATIVE ACCELERATION DRIVEN ENERGY INTERRUPTOR AS A MISSILE SAFETY-ARMING SWITCH
TOPIC# 170 OFFICE: NWC/NAVAIR IDENT#: 19323

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IN THE PHASE I EFFORT ENFITEK DEMONSTRATED THE FEASIBILITY OF A NUMBER OF INNOVATIVE CONCEPTS FOR AN ACCELERATION DRIVEN ENERGY INTERRUPTER THAT CAN FUNCTION AS A SAFETY-ARMING SWITCH FOR A MISSILE SYSTEM. A TOTAL OF NINETEEN ELECTRO- AND OPTOMECHANICAL ACCELEROMETER CONCEPTS WERE DEEMED FEASIBLE BUT ONLY FOUR ARE PROPOSED AS MOST PROMISING FOR PHASE II PTOTOTYPING AS FOLLOWS: GAS CHAMBER AND DIAPHRAGM (GCD); ELECTORRHEOLOGICAL FLUIDS (ER); MICROBENDING SENSORS (MBS); AND OPTOMECHANICAL ACCELEROMETER (OMA). EIGHT TIMER CONCEPTS WERE JUDGED FEASIBLE FOR USE IN CONJUNCTION WITH THE FOUR ACCELEROMETER OPTIONS. ALL OF THESE PROPOSED PHASE II CHOICES MEET REQUIREMENTS OF COST, SIMPLICITY, SIZE, WEIGHT, PERFORMANCE, RELIABILITY, AND SAFETY. A TWO-YEAR FIVE-STEP PROTOTYPE DEVELOPMENT PROGRAM IS PRESENTED FOR THE WORK PLAN; I.E. FIRST DESIGN AND SUPPLIER CONSULTATION, DETAILED DESIGN, COMPONENT PROCUREMENT AND MANUFACTURE, PROTOTYPE CONSTRUCTION AND PRELIMINARY TESTING, AND FINAL TESTING AND MANUAL PRODUCTION. THE WORK SCHEDULE WOULD BE PHASED TO AVOID OVERTAXING MANPOWER CAPABILITIES AND CREATING SLACK TIME.

EXFLUOR RESEARCHCORP
PO BOX 7807
AUSTIN, TX 78713
CONTRACT NUMBER:
DR TIMOTHY J JUHLKE

TITLE:
IMPROVED METHOD FOR THE SYNTHESIS OF DIFUNCTIONAL FLUOROALCOHOLS
TOPIC# 156 OFFICE: NSWC IDENT#: 17798

SEVERAL PERFLUORODICARBOXYLIC ACIDS WILL BE PRODUCED BY DIRECT FLUORINATION AND REDUCED TO THE CORRESPONDING DIFUNCTIONAL FLUOROALCOHOLS. WITH DIRECT FLUORINATION ONE CAN PRODUCE FLUOROALCOHOLS WHICH CONTAIN LONG CHAIN OR BRANCHED FLUOROCARBON SECTIONS EASIER THAN BY CONVENTIONAL METHODS. IN ADDITION, SOME PERFLUOROPOLYETHER DIACIDS WILL BE MADE AND CONVERTED TO THE FLUORINATED DIOLS. AT THIS SAME TIME A MINIPLANT WILL BE CONSTRUCTED WHICH IS CAPABLE OF PRODUCING FIVE POUNNDS PER DAY OF THE DIOLS. THE ABILITY TO VARY THIS LENGTH AND COMPOSITION OF THE FLUORINATION PORTION OF THE DIOL SHOULD ALLOW SOME TAILORING

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OF POLYMER PROPERTIES WHEN THESE DIOLS ARE USED AS COMPONENTS OF
POLYMERS.

EXPERT-EASY SYSTEMS INC
1301 SHOREWAY RD - STE 420
BELMONT, CA 94002
CONTRACT NUMBER: N00163-88-C-0024
STEVEN W ENGLE
TITLE:
AUTONOMOUS TARGET RECOGNITION USING NEURAL NETWORKS
TOPIC# 251 OFFICE: NAC/NAVAIR IDENT#: 19414

THE PHASE I RESEARCH HAS DEMONSTRATED THE CAPABILITIES OF NEURAL NETWORKS IN VISION RELATED APPLICATIONS, AND THE TECHNOLOGY HAS CONSIDERABLE PROMISE IN A VARIETY OF OTHER APPLICATION AREAS AS WELL. HOWEVER, THERE IS STILL A CONSIDERABLE AMOUNT OF RESEARCH TO BE PERFORMED BEFORE THE FULL POTENTIAL OF APPLICATIONS IS UNDERSTOOD. IN THE LIGHT OF THIS SITUATION, THE PHASE II PROJECT WILL FOCUS ON THE FURTHER DEVELOPMENT OF THE VOLTS SYSTEM, EXPANDING ITS CAPABILITIES AS A TOOL FOR USE IN GENERAL NEURAL NET RESEARCH BY IMPLEMENTING THE PORTABLE NEURAL ENVIRONMENT (PNE). THE PNE WILL INCLUDE SUPPORT FOR FULL PORTABILITY ACROSS A VARIETY OF COMPUTER ARCHITECTURES, INCLUDING PARALLEL PROCESSORS, AND WILL FORM THE BASIS FOR A HIGH-PERFORMANCE, COST-EFFECTIVE NEURAL NET WORKSTATION. THE SYSTEM WILL THEN BE USED TO IMPLEMENT A FULL CAPABILITY NEURAL NET-BASED NAVIGATION SYSTEM USING AERIAL IMAGERY.

FAILURE ANALYSIS ASSOC/SIGMA RESEARCH
8411 - 154TH AVE NE
REDMOND, WA 98052
CONTRACT NUMBER:
BILL McDONALD
TITLE:
ON-LINE DATABASE FOR ARCHIVING MATERIAL RREVIEW BOARD RECORDS
TOPIC# 102 OFFICE: NAVAIR IDENT#: 16267

FAILURE ANALYSIS ASSOCIATES (FaAA) PROPOSES TO DEVELOP A DATABASE

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MANAGEMENT SYSTEM TO PERMIT ON-LINE STORAGE AND RETRIEVAL OF MATERIALS REVIEW BOARD RECORDS. THE DATABASE WILL BE CAPABLE OF STORING IMAGES SUCH AS SKETCHES, PHOTOGRAPHS, AND HAND WRITTEN EQUATIONS AS WELL AS TYPED TEST. THE DESIGN OBJECTIVE OF THE DATABASE WILL BE TO STORE ALL INFORMATION IN A FORMAT THAT IS AS CLOSE TO THE ORIGINAL RECORDS AS POSSIBLE. THE MRB RECORDS WILL BE LOADED INTO THE DATABASE USING AN IMAGE SCANNER. THE DATABASE WILL RESIDE ON A LARGE CAPACITY WRITE-ONCE-READ-MANY (WORM) OPTICAL DISK. DATABASE RECORDS WILL BE DISPLAYED ON A HIGH RESOLUTION GRAPHICS MONITOR AND HARDCOPY WILL BE AVAILABLE USING A LASER PRINTER. THIS SYSTEM WILL PERMIT THE NAVY TO RAPIDLY ASSESS THE SIGNIFICANCE OF ANOMALIES DETECTED DURING ROUTINE INSERVICE INSPECTION OF AIRCRAFT COMPONENTS. THE BENEFIT OF THIS SYSTEM TO THE NAVY IS REDUCE AIRCRAFT DOWNTIME WHICH TRANSLATES DIRECTLY INTO IMPROVED UTILIZATION AND READINESS OF THE FLEET.

FIBERTEK INC
510-A HERNDON PKWY
HERNDON, VA 22070
CONTRACT NUMBER:
DR GARRY SPECTOR
TITLE:
FIBER OPTIC SENSOR FOR TORPEDO GEAR EVALUATION
TOPIC# 62 OFFICE: NAVSEA IDENT#: 16460

FIBERTEK PROPOSES A TWO PART PROGRAM FOR THE TWO YEAR SBIR PHASE II STUDY. THE FIRST PART OF THE PROGRAM WILL BE A FIBER EVALUATION/GEARBOX CONSTRUCTION PHASE. THE FIBER EVALUATION WILL BE COMPOSED OF TESTING VARIOUS COMMERCIAL FIBER OPTICS IN A CALIBRATED TEST APPARATUS TO DETERMINE THE OPTIMUM FIBER OPTIC FOR PRESSURE SENSING. AT THE SAME TIME, A GEARBOX WILL BE CONSTRUCTED TO CONFORM TO NAVY SIZE AND CAPABILITY SPECIFICATIONS, IN ORDER TO EVALUATE SEVERAL DIFFERENT GEARS IN VARIOUS CONFIGURATIONS. THE SECOND HALF OF THE PROGRAM WILL BE FOCUSED ON THE EVALUATION OF DIFFERENT GEAR SYSTEMS. FIBERTEK WILL STUDY AND ESTABLISH RELATIONSHIPS BETWEEN THE INDUCED PRESSURE SIGNAL AND SUCH PARAMETERS AS GEAR SPEED, SIZE AND TYPE, FLUID TYPE AND VISCOSITY, AND AMBIENT TEMPERATURE. IN ADDITION, THE RELATIONSHIP BETWEEN PRESSURE AND NOISE GENERATED BY THE GEARS WILL BE INVESTIGATED.

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FLAM & RUSSELL INC
PO BOX 444
HORSHAM, PA 19044
CONTRACT NUMBER:
LAWRENCE R BURGESS
TITLE:
A VARIABLE NULLING THRESHOLD ADAPTIVE ARRAY
TOPIC# 38 OFFICE: NOSC IDENT#: 15768

THE TECHNICAL OBJECTIVE OF THE SBIR PHASE II EFFORT ON "ADAPTIVE TECHNIQUES TO IMPROVE HF COMMUNICATIONS" IS TO IMPROVE THE ANTI-JAM (AJ) CAPABILITY OF A TYPICAL NAVY COMMUNICATIONS SYSTEM. WE PROPOSE TO DO THIS BY BUILDING AND DEMONSTRATING A VARIABLE NULLING THRESHOLD (VNT) ADAPTIVE ARRAY THAT OPERATES AS AN ALLIQUED WITH A LINK-II RECEIVER AND MODEM. THE VNT IS A DESIRED SIGNAL PROTECTION SCHEME THAT PROTECTS THE DESIRED SIGNAL ON THE BASIS OF POWER. BY SETTING THE NULLING THRESHOLD EQUAL TO THE POWER OF THE DESIRED SIGNAL, THE VNT ADAPTIVE ARRAY EFFECTIVELY OPTIMIZES THE SIGNAL-TO-INTERFERENCE-PLUS-NOISE RATIO. THAT IS, IT SUPPRESSES THE LEVEL OF JAMMERS MORE POWERFUL THAN THE DESIRED SIGNAL WITHOUT AFFECTING ITS LEVEL. THIS IS ACCOMPLISHED IN REAL-TIME WITHOUT INCREASING THE NOISE IN THE SYSTEM. THE SYSTEM WE PROPOSE TO BUILD CONSISTS OF A NUMBER OF SUBSYSTEMS. FLAM & RUSSELL, INC. HAS BEEN DESIGNING AND BUILDING HF ADAPTIVE ARRAYS SINCE ITS INCORPORATION IN 1980 AND HAVE HAD EIGHT CONTRACTS TO DO SO. BECAUSE OF THIS WIDE RANGE OF EXPERIENCE, MOST OF THE SUBSYSTEMS IN THE PROPOSED VNT ADAPTIVE ARRAY HAVE PREVIOUSLY BEEN BUILT AND DEMONSTRATED. THUS, THE PROPOSED PROGRAM REPRESENTS A MINIMUM RISK ONE THAT WILL ALLOW US TO CONCENTRATE UPON THE REAL EFFORT; PROVIDING THE NAVY WITH MORE RELIABLE AND JAM-RESISTANT COMMUNICATIONS.

FLOW RESEARCH CO
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER: N00164-87-C-0235
JACK J KOLLE
TITLE:
MICRO/MACRO MECHANICS
TOPIC# 179 OFFICE: NWSC/SSPO IDENT#: 19120

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THE PHASE II PROJECT PROPOSED HERE PROVIDES FOR THE VERIFICATION AND IMPLEMENTATION OF MATERIAL CHARACTERIZATION SOFTWARE FOR ADVANCED COMPOSITE MATERIALS. THE APPROACH IS BASED ON A MICROSCOPIC ANALYSIS OF FIBER/MATRIX GEOMETRY AND MATERIAL PROPERTIES. THE PROPOSED WORK WILL FOCUS ON DEVELOPING SOFTWARE THAT WILL ALLOW AN ENGINEER WITH LITTLE OR NO FINITE ELEMENT EXPERIENCE TO CHARACTERIZE ADVANCED COMPOSITE MATERIALS ON THE MICROSCOPIC SCALE. THE USER WILL NEED TO SPECIFY THE TYPE OF COMPOSITE, THE MACROSCOPIC PROPERTIES DESIRED AND THE RELEVANT CONSTITUENT PROPERTIES. THE CODE WILL AUTOMATICALLY SELECT AN APPROPRIATE MESH AND BOUNDARY CONDITIONS FROM A LIBRARY OF FINITE ELEMENT MODELS AND SOLVE FOR THE DESIRED MACROSCOPIC PROPERTIES. THE WORK WILL INCLUDE THE DEVELOPMENT OF ANALYSIS PROCEDURES FOR FRACTURE PARAMETERS, STIFFNESS, THERMAL EXPANSION AND CONDUCTIVITY COEFFICIENTS. SAMPLES OF METAL MATRIX COMPOSITES WILL BE TESTED TO VERIFY ANALYTICAL PREDICTIONS ON THE STRAIN FIELD IN A COMPOSITE FRACTURE SPECIMEN.

FLUOROCHEM INC
680 S AYON AVE
AZUSA, CA 91702
CONTRACT NUMBER:
KURT BAUM
TITLE:
ENVIRONMENTALLY STABLE FLUOROPOLYMERS
TOPIC# 7 OFFICE: ONR IDENT#: 17252

PROCESS DEVELOPMENT WILL BE CARRIED OUT TO FACILITATE THE PRODUCTION OF NEW FLUOROPOLYMER INGREDIENTS THAT WERE SYNTHESIZED UNDER PHASE I. OTHER FLUOROPOLYMER INGREDIENTS WILL BE SYNTHESIZED THIS TECHNOLOGY.

FLUOROCHEM INC
680 S AYON AVE
AZUSA, CA 91702
CONTRACT NUMBER:
KURT BAUM
TITLE:
SYNTHESIS PROCESS FOR BIS(DINITROPROPYL) FORMAL/DINITROBUTYL
DINITROPROPYL FORMAL PLASTICIZER
TOPIC# 157 OFFICE: NSWC IDENT#: 17799

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PROCESS DEVELOPMENT STUDIES AND CHARACTERIZATION WILL BE CARRIED OUT OF MIXED FORMAL PLASTICIZERS DERIVED FROM NITROETHANE AND L-NITROPROPANE. MIXED PLASTICIZERS BASED ON ETHERS RATHER THAN FORMALS WILL BE PREPARED.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: N60921-90-C-0303
W E SCHROEDER
TITLE:
IMPROVED OPTICAL TRACKING PROCESSOR
TOPIC# 132 OFFICE: NSWC IDENT#: 17772

THE PHASE I IOTP DEVELOPMENT PROJECT DEMONSTRATED THE ABILITY OF THE BASIC TRACKING UNIT TO ACQUIRE, TRACK, AND REPORT ON MULTIPLE TARGETS IN REAL TIME (30 FRAMES PER SECOND). ALGORITHMS WERE ALSO DEMONSTRATED WITH WHICH THE TRACKED TARGETS WERE CATEGORIZED OR CLASSIFIED AS HOSTILE/NON HOSTILE BASED ON OBJECT DYNAMICS AND GEOMETRY AND THEIR RATES OF CHANGE. THE PROPOSED PHASE II WORK WILL PROVIDE FURTHER DEVELOPMENT OF THIS MULTI-OBJECT TRACKER WITH AUTOMATIC TARGET ACQUISITION. THIS WILL ENABLE THE CLASSIFICATION OF TARGETS IN REAL TIME, AND THE INTEGRATION OF THE IOTP WITH A GFE FIRE CONTROL SYSTEM (TENTATIVELY PHALANX CIWS). MOST APPROACHES TO OPTICAL TRACKING HAVE INVOLVED CENTROID TRACKING, ROSETTE SCANNING, EDGE TRACKING AND SO CALLED "INTELLIGENT" (BAYESIAN) ALGORITHMS. ALL OF THESE METHODS HAVE FUNDAMENTAL FLAWS WHICH MAKE THEM VULNERABLE TO COUNTERMEASURES. THE PROPOSED IOTP TRACKS ALL OBJECTS OF SUFFICIENT SIZE AND/OR INTENSITY IN THE SCENE, AND INDEPENDENTLY REPORTS ON THE GEOMETRY AND BEHAVIOR OF THESE OBJECTS SO THAT THEY CAN BE CLASSIFIED AND ENGAGED SEQUENTIALLY IN ACCORDANCE WITH THEIR CLASSIFICATION, THUS OVERCOMING THE INHERENT WEAKNESS IN EXISTING VIDEO TRACKING SYSTEMS.

FOSTER-MILLER INC (OLD: SUPER RADIANT)
350 DECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
DR LAWRENCEH DOMASH
TITLE:
MacBEEP: A COMPUTER WORKSTATION FOR HOLOGRAPHIC OPTICAL
ELEMENTS
TOPIC# 160 OFFICE: NSWC IDENT#: 17803

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COMPUTER GENERATED PHASE-ONLY HOLOGRAPHIC OPTICAL ELEMENTS ARE INCREASINGLY IN DEMAND FOR PATTERN RECOGNITION FILTERS, LASER BEAM STEERING ELEMENTS, ASPHERIC LENS SUBSTITUTES, AND MANY OTHER APPLICATIONS. PREVIOUS METHODS TO FABRICATE THESE INVOLVED MAIN-FRAME COMPUTER SYSTEMS AND OFF-SITE ELECTRON BEAM FABRICATION FACILITIES, AND HAVE BEEN EXPENSIVE, SLOW, INFLEXIBLE AND INCONVENIENT FOR USERS. PHASE I RESEARCH DEMONSTRATED THAT USEFUL BINARY ELEMENTS WITH 10,000 X 10,000 PIXELS OF 10 MICRON FEATURE SIZE CAN BE PRODUCED ON HIGH-DEFINITION INDUSTRIAL LASER TYPESETTERS WIDELY AVAILABLE FOR THE ELECTRONIC PUBLISHING INDUSTRY. POSTSCRIPT, THE STANDARD GRAPHICS COMPUTER LANGUAGE OF ELECTRONIC PUBLISHING, WAS SHOWN TO PROVIDE A SURPRISINGLY POWERFUL SOFTWARE ENVIRONMENT FOR MANIPULATING IMAGES, FOURIER TRANSFORMS AND OTHER DIFFRACTIVE OPTICS PATTERNS. THE PHASE II PROGRAM WILL DEMONSTRATE A SELF-CONTAINED "DESKTOP WORKSTATION" WITH A MACINTOSH II FRONT END FOR THE DESIGN, CALCULATION AND PRODUCTION OF MODERATE RESOLUTION BINARY OPTICAL ELEMENTS. PROPOSED TASKS INCLUDE IMPROVED FFT/POSTSCRIPT SOFTWARE, DEVELOPMENT OF PROCESSING METHODS TO DIRECTLY PRODUCE PHASE-ONLY ELEMENTS FROM THE LASER TYPESETTER, AND IMPROVE FEATURE SIZE FROM 10 MICRONS/PIXEL TO 2-4 MICRONS/PIXEL. THE SYSTEM WILL OFFER THE BINARY OPTICS RESEARCHER A CONVENIENT, EASY TO USE DEVELOPMENT TOOL FOR THE FIRST TIME.

GAERTNER W W RESEARCH INC

140 WATER ST

NORWALK, CT 06854

CONTRACT NUMBER:

CHRIS GAERTNER

TITLE:

THE DESIGN AND CONSTRUCTION OF NOVEL HEAD ATTITUDE SENSOR

TOPIC# 217 OFFICE: NTSC/NAVAIR IDENT#: 18956

IT IS PROPOSED TO IMPLEMENT THE CONCEPT FOR THE NOVEL HEAD-TRACKER SYSTEM, DEVELOPED UNDER PHASE I, WHICH WAS DEVELOPED TO ACHIEVE .5 MIN ACCURACY AND 240 HZ SAMPLING RATE DESIRED BY NTSC. AS SUCH, IT WILL BE MUCH MORE ACCURATE AND FASTER THAN ANY OTHER HEAD TRACKER CURRENTLY AVAILABLE. KEY FEASIBILITY EXPERIMENTS WERE CARRIED OUT UNDER PHASE I WHICH SUPPORT THE ASSUMPTIONS ON WHICH THE DESIGN FOR

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THE PHASE II EFFORT IS BASED. IT IS PROPOSED TO DEVELOP A FINISHED HEAD-TRACKER PRODUCT UNDER PHASE II, AND INSTALL IT IN THE NTSC SIMULATOR.

GEOPEX LTD
5100 HOLLY SPRINGS RD
RALEIGH, NC 27606
CONTRACT NUMBER:
I J WON/ANTHONY ROUTLEDGE
TITLE:

APPLICATION OF THE AIRBORNE ELECTROMAGNETIC METHOD TO
SUBMARINE DETECTION

TOPIC# 22 OFFICE: ONT IDENT#: 15661

AS A FOLLOW-ON TO THE PHASE I FEASIBILITY STUDY OF AN AIRBORNE ELECTROMAGNETIC (AEM) METHOD FOR DETECTING SUBMARINES, PHASE II WILL INCLUDE SEVEN SUBTASKS UNDER TWO MAJOR TASKS: 1) DEVELOPMENT OF COMPUTER SOFTWARE FOR CONDUCTING PROFILING AND ITS APPLICATION TO AVAILABLE GEOPEX AEM DATA; AND 2) EVALUATION OF OCEANOGRAPHIC NOISE. THE FIRST THREE SUBTASKS DEVELOP, OPTIMIZE AND DEMONSTRATE THE FEASIBILITY OF USING THE COMPUTER SOFTWARE. AFTER SAID DEMONSTRATION, A MODIFICATION OF A CODE WILL BE USED TO PREDICT THE CONTINUOUS WAVE RESPONSE TO SEA SURFACE FLUCTUATIONS. THE FIFTH SUBTASK WILL USE THE COHERENT SIMULATOR TO ESTABLISH SIGNAL PROCESSING TECHNIQUES AGAINST SURFACE WAVE NOISE. IN THE LAST TWO SUBTASKS, SYSTEM PERFORMANCE AGAINST SURFACE WAVE NOISE WILL BE ESTIMATED FOR A TYPICAL SIGNAL AND POSSIBLE MODIFICATIONS TO THE SYSTEM, FAVORED OPERATING MODES AND FIELD TEST SCENARIOS WILL BE INVESTIGATED TO SUPPORT VARIOUS CONCLUSIONS AND RECOMMENDATIONS TO BE PROVIDED.

GROSS T A O INC
230 CONCORD RD
LINCOLN, MA 01773
CONTRACT NUMBER:

T A O GROSS

TITLE:

SPLIT-TRANSFORMER PERFORMANCE MODELING

TOPIC# 195 OFFICE: NUSC IDENT#: 18218

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A SPLIT-TRANSFORMER SYSTEM IS PROPOSED TO FUNCTION AS A NON-CONTACTING CONNECTOR. IT WILL COUPLE - BY MEANS OF A SINGLE MAGNETIC CIRCUIT - DATA COMMUNICATIONS AND 400 WATTS OF ELECTRICAL POWER ACROSS A VARIABLE CLEARANCE GAP IN THE RANGE OF 0 TO 0.4 cm. THE DATA RATE WILL BE 100 kb/s AND 10 kb/s IN THE FORWARD AND REVERSE DIRECTIONS RESPECTIVELY. THE SPLIT-TRANSFORMER WILL OPERATE IN AIR OR IN SEA-WATER WHERE IT WILL HAVE ADVANTAGES, OVER CONVENTIONAL CONNECTORS, WITH RESPECT TO EFFECTS OF CORROSION AND MISALIGNMENT.

HANNIGAN COMPUTER APPLICATIONS CO
RTE 2 - BOX 250
WARRENTON, VA 22186
CONTRACT NUMBER:
FRANK J HANNIGAN
TITLE:
EXPERT SYSTEM FOR DIRECTING PROPULSION TECHNOLOGY
TOPIC# 227 OFFICE: NAPC/NAVAIR IDENT#: 19993

THE WORK IN PHASE II WILL CONCENTRATED ON DEVELOPING AN EXPERT SYSTEM FOR DIRECTING PROPULSION TECHNOLOGY BASED ON THE RECOMMENDATIONS FROM PHASE I.

HUNTER RESEARCH INC
PO BOX 22737
MELBOURNE, FL 32902
CONTRACT NUMBER:
THOMAS H OTTEN
TITLE:
AUTOMATED BEST SOURCE SELECTOR
TOPIC# 215 OFFICE: PMTC/NAVAIR IDENT#: 19061

THIS PROPOSAL ADDRESSES THE NEED TO PROVIDE AN AUTOMATIC BEST SOURCE SELECTION OR BEST DATA ESTIMATE FOR UP TO EIGHT SPACE OR FREQUENCY DIVERSIFIED SOURCES OF TELEMETRY DATA. AN AUTOMATED BEST SOURCE SELECTOR IS PROPOSED FOR EVALUATION WHICH MEETS THE REQUIREMENT WITH

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THREE OUTPUT MODES; A BEST SOURCE SELECTION AS DETERMINED FROM ITS RELIABILITY IS RECONSTRUCTED FRAME SYNCHRONIZATION WORD, A BEST ESTIMATE VIA MAJORITY VOTING, AND COMBINED MODE WHICH AUTOMATICALLY OUTPUTS THE BEST ESTIMATE WHEN AT LEAST THREE OF THE EIGHT SOURCES EXHIBIT HIGH DATA INTEGRITY OR THE BEST SOURCE UNDER OTHER CONDITIONS. SWITCHOVER BETWEEN SOURCES AND BETWEEN THE BEST SOURCE AND BEST ESTIMATE IS AUTOMATIC WITHOUT PHASE OR TIMING TRANSIENTS WHICH COULD DISTURB RECORDING, PROCESSING, OR DISPLAY EQUIPMENTS RECEIVING THE OUTPUT OF THE AUTOMATED BEST SOURCE SELECTOR. KEY FEATURES OF THE DESIGN INCLUDE BUFFERING OF THE DATA SOURCES TO ALLOW FOR DIFFERENTIAL RANGE VARIATIONS AMONG THE RECEIVING STATIONS DURING THE COURSE OF THE MISSILE FLIGHT BEING MONITORED, AND THE ACQUISITION AND MAINTENANCE OF DATA REGISTRATION (TIME ALIGNMENT) OF THE EIGHT SOURCES OF DATA.

INDUSTRIAL QUALITY INC
PO BOX 2519 -19634 CLUB HOUSE RD/STE 320
GAITHERSBURG, MD 20879

CONTRACT NUMBER:

HAROLD BERGER

TITLE:

DEVELOPMENT OF DATA FILE STANDARDS FOR AUTOMATED ULTRASONIC
SCANNING SYSTEMS

TOPIC# 102 OFFICE: NAVAIR IDENT#: 16266

THIS PHASE II PROGRAM WILL INCLUDE THE DEVELOPMENT AND DEMONSTRATION OF METHODS TO EXCHANGE ULTRASONIC INSPECTION DATA FROM AN AUTOMATED INSPECTION UNIT AT A MANUFACTURER OF NAVY AIRCRAFT TO ONE AT A NAVY AIR DEPOT (NADEP) AND VICE CERSA. THE METHODS WILL EMPHASIZE AN INTERMEDIATE FILE FORMAT EXCHANGE SUCH AS THE WELL ESTABLISHED INITIAL GRAPHICS EXCHANGE SPECIFICATION (IGES), AS NOW USED IN THE CAD/CAM FIELD, OR THE RELATED PRODUCT DATA EXCHANGE SPECIFICATION (PDES). THESE INTERMEDIATE APPROACHES OFFER PROTECTION FOR PROPRIETARY INFORMATION, AN IMPORTANT FACTOR IN GAINING ACCEPTANCE OF SUCH AN EXCHANGE SYSTEM BY MANUFACTURERS OF AUTOMATED INSPECTION SYSTEMS. THE INITIAL WORK IN THE PROGRAM WILL INVOLVE A REVIEW OF DATA EXCHANGE SYSTEMS AND THE ESTABLISHMENT OF PARAMETERS, DEFINITIONS AND FORMAT TO BE USED. A WORKSHOP WITH INVITED ULTRASONIC AND DATA EXCHANGE EXPERTS FROM GOVERNMENT AND INDUSTRY AND

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HOSTED BY THE NATIONAL BUREAU OF STANDARDS, WILL PROVIDE INPUT TO THESE SELECTIONS. DURING THE PROGRAM PRE AND POST PROCESSORS FOR TWO DIFFERENT ULTRASONIC SYSTEMS WILL BE DEVELOPED AND TESTED. MORE GENERAL CONCEPTS FOR THE PROCESSORS WILL BE DEVELOPED AS AN INITIAL STEP IN BROADENING THE AVAILABILITY OF ULTRASONIC DATA EXCHANGE.

INFORMATION SYSTEMS LABS
3130 BOONE BLVD - STE 500
VIENNA, VA 22180
CONTRACT NUMBER:
JOHN E DON CARLOS

TITLE:

SUBMARINE COMMUNICATION IN DIRECT SUPPORT OF A BATTLE GROUP
TOPIC# 34 OFFICE: NOSC IDENT#: 17760

PHASE I DEVELOPED A CONCEPT FOR A BUOYANT CABLE ARRAY TWO-WAY COMMUNICATION ANTENNA AND CALCULATED OVER-THE-HORIZON RANGES WITH DESIRABLE LPI AND A/J PROPERTIES. THE WORK PROPOSED IN PHASE II EXTENDS THE ANALYSIS AND THEORETICAL MODELLING TO INCLUDE STATE EFFECTS, ADDITIONAL ELEMENT TYPES, DEPTH SPEED IMPROVEMENTS AND IMPLEMENTATION CONSIDERATIONS. EXPERIMENTS ARE PROPOSED TO SUPPLEMENT AND DEMONSTRATE THE THEORY. OTHER RECOMMENDATIONS OF PHASE I ARE ALSO PROPOSED.

INTEGRATED SOFTWARE INC
BOX 060295
PALM BAY, FL 32906
CONTRACT NUMBER: N61339-89-C-0028
STEVEN A VON EDWINS

TITLE:

IMPLEMENTATION OF ADA ON DISTRIBUTED MICROPROCESSOR COMPUTER ARCHITECTURES FOR AIRCREW TRAINING SYSTEMS
TOPIC# 218 OFFICE: NTSC/NAVAIR IDENT#: 18960

PHASE I RESEARCH DEFINED AN OVERALL EIGHT STEP PLAN FOR IMPLEMENTING ADA ON DISTRIBUTED MICROPROCESSOR COMPUTER ARCHITECTURES FOR MAJOR AIRCREW TRAINING SYSTEMS. THE PHASE II RESEARCH PROPOSED HEREIN

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EXECUTES THE FOUR STEPS WHICH COMPRISE THE CRITICAL PATH OF THAT PLAN, NAMELY: 1) RESEARCH AND ESTABLISH A SOFTWARE AND HARDWARE ARCHITECTURE; 2) RESEARCH AND DEVELOP A SUPPORTING ADA RUNTIME ENVIRONMENT; 3) RESEARCH AND DEFINE A SUPPORTING DEVELOPMENT PROCESS INCLUDING REUSABILITY; AND 4) DEVELOP AND DEMONSTRATE A PROOF-OF-CONCEPT SYSTEM. PHASE II IS PLANNED TO PROVIDE THE FOUNDATION NECESSARY FOR USING DISTRIBUTED MICROPROCESSOR PROGRAMMED IN ADA FOR MAJOR AIRCREW TRAINING SYSTEM ACQUISITIONS. PHASE II RESEARCH WILL ALSO BE DIRECTED TOWARD ESTABLISHING GUIDELINES FOR PRODUCING REUSABLE SOFTWARE COMPONENTS FOR AIRCREW TRAINING SYSTEMS. THE PHASE II PROOF-OF-CONCEPT SYSTEM, BASED ON THE V-22 SIMULATOR, WILL PROVIDE A TESTBED AT THE VISUAL TECHNOLOGY RESEARCH SIMULATOR (VTRS), NTSC, ORLANDO, FL. FOR FUTURE RESEARCH.

INTELLIGENT SYSTEMS DESIGNS INC
15400 SE 30TH PL - NCR CENTER/STE 101
BELLEVUE, WA 98007

CONTRACT NUMBER:

STANLEY R PATTON

TITLE:

AUTOMATING VIDEO TRAINING DEVELOPMENT THROUGH INTELLIGENT
DATA BASE DESIGNS

TOPIC# 150 OFFICE: NSWC IDENT#: 17794

TO CONTINUE THE RESEARCH AND DEVELOPMENT OF AN DESKTOP MEDIA PROCESSING ENVIRONMENT FOR USE BY NAVY TECHNICIANS TO PRODUCE AND DELIVER INTERACTIVE TRAINING PROGRAMS. THE PHASE-II PROJECT IS DIVIDED INTO THREE PRIMARY R&D SEGMENTS: (#1) RESEARCH THE METHODS NEEDED TO INPUT AND STORE DIVERSE JOB MEDIA IN A MEDIA DATABASE; (#2) RESEARCH A MANAGER MODULE FOR ORGANIZING, CONTROLLING AND MAINTAINING THE MEDIA DATABASE; AND (#3) RESEARCH THE SOFTWARE ROUTINES FOR AUTHORIZING INTERACTIVE PROGRAMS INCLUDING PRODUCTION OF FOUR EXPERIMENTAL TYPES OF INTERACTIVE PROGRAMS. THESE MATERIALS WILL INCLUDE INTERACTIVE JOB AIDS, A VIDEO/CBT COURSE, A SET OF JOB CERTIFICATION TESTS AND PERSONNEL TRAINING PROFILES FOR THE NAVY'S NEW HCN ROBOT FOR TORPEDO MAINTENANCE. PRODUCTION OF THESE PROGRAMS WILL BE USED TO TEST AND REVISE THE MANAGER MODULE AND SOFTWARE ROUTINES BY THE JOINT NAVY/CONTRACTOR TEAM AT THE NUWES FACILITY. A FINAL REPORT WILL BE DELIVERED DOCUMENTING RESEARCH ACCOMPLISHMENTS

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INCLUDING A SET OF SPECIFICATIONS FOR AN OPERATIONAL, PHASE-III,
MEDIA PROCESSING ENVIRONMENT.

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER:
DR KENNETH ABEND

TITLE:

NEAR FIELD FOCUSED RANDOM ARRAY

TOPIC# 188 OFFICE: NADC/ONT IDENT#: 19075

THE OBJECTIVE IS TO REFINE, VALIDATE, AND EVALUATE THE NEAR-FIELD FOCUSED RANDOM ARRAY (NFRA) CONFIGURATION AND PROCESSING TECHNIQUE DESIGNED IN PHASE I IN REALISTIC ENVIRONMENTS. THE NFRA IS A HIGH-GAIN PASSIVE ARRAY OF SONOBUOYS TO BE RANDOMLY DEPLOYED BY THE P-3C UPDATE IV OVER AN AREA OF SEVERAL NAUTICAL MILES DIAMETER TO COHERENTLY IMAGE A LARGE AREA OF THE OCEAN TO DETECT AND LOCATE TARGETS IN RANGE AS WELL AS ANGLE, WHILE SUPPRESSING STRONG INTERFERING SOURCES OUTSIDE OF THE ARRAY'S FOCAL REGION. THIS EFFORT INVOLVES (1) A NFRA SYSTEM DESIGN INCLUDING HARDWARE REQUIREMENTS, (2) DETERMINATION OF THE EFFECTS OF THE UNDERWATER PROPAGATION MEDIUM (ESPECIALLY MULTIPATH) ON THE DESIGN AND ITS PERFORMANCE, (3) DEVELOPMENT AND EVALUATION OF TECHNIQUES FOR OPERATING THE NFRA COHERENTLY, (4) A NFRA COMPUTER SIMULATION INCORPORATING THE THIRD DIMENSION (VERTICAL) AND THE EFFECTS OF THE MEDIUM, (5) DEVELOPMENT OF A PLAN FOR DATA COLLECTION AND ANALYSIS, AND (6) THE GENERATION OF PERFORMANCE PREDICTIONS FOR THE NFRA IN VARIOUS SCENARIOS AND OCEAN CONDITIONS, INCLUDING PREDICTIONS OF THE RESULTS OF A DATA COLLECTION AND ANALYSIS PROGRAM.

J&D SCIENTIFIC INC
2854 S HAVEN DR
ANNAPOLIS, MD 21401
CONTRACT NUMBER:
LARRY D MCCORMICK

TITLE:

SCANNING TUNNELING MICROSCOPY DEVELOPMENT FOR IN SITU
CORROSION RESEARCH

TOPIC# 155 OFFICE: NSWC IDENT#: 17797

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THE INITIAL PHASE II EFFORT WILL BE TO BUILD AND TEST THE STM DESIGNED IN PHASE I. THEN THE SYSTEM WILL BE USED UNDER CONTROLLED ELECTROCHEMICAL CONDITIONS TO IMAGE IRON-BASED ELECTRODES IN SEVERAL ENVIRONMENTS.

J&D SCIENTIFIC INC
2854 S HAVEN DR
ANNAPOLIS, MD 21401
CONTRACT NUMBER:
LARRY D MCCORMICK
TITLE:
SCANNING TUNNELING MICROSCOPY OF ALUMINUM METAL MATRIX COMPOSITES DURING STRESS CORROSION CRACKING
TOPIC# 180 OFFICE: NWSC/SSPO IDENT#: 19133

THE PHASE I APPLICATION OF SCANNING TUNNELING MICROSCOPY (STM) TO Al IN WATER DEMONSTRATED THAT IMAGING OF THIS SURFACE COULD BE OBTAINED WITH RESOLUTION BETTER THAN 1 NANOMETER. THE GOAL OF THE PHASE II RESEARCH IS TO EXTEND THE PHASE I EFFORT TO INCLUDE IMAGING DURING POTENTIAL AND STRESS CONTROL. DURING PHASE II, STUDIES WILL BE PERFORMED ON Al ALLOYS AND Al METAL MATRIX COMPOSITES.

KMS FUSION INC
PO BOX 1567 - 3853 RESEARCH PK
ANN ARBOR, MI 48106
CONTRACT NUMBER:
DR JAMES G DOWNWARD
TITLE:
ADVANCED DIGITAL FRINGE ANALYSIS WORKSTATION
TOPIC# 138 OFFICE: NSWC IDENT#: 17778

NSWC USES HOLOGRAPHIC AND INTERFEROMETRIC TECHNIQUES TO MEASURE WIND TUNNEL FLOW FIELD DENSITY DISTRIBUTIONS. HOWEVER, THESE TECHNIQUES ARE UNDERUTILIZED BECAUSE ANALYSIS OF THE FRINGE DATA IS CUMBERSOME AND TIME CONSUMING. THE GOAL OF THIS PROPOSAL IS TO DEVELOP A FRINGE ANALYSIS WORKSTATION THAT ALLOWS COMPLEX FRINGE IMAGE DATA TO BE

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PROCESSED EASILY AND RAPIDLY. DURING PHASE I, KMSF DETERMINED THE WORKSTATION'S COMPUTER HARDWARE CONFIGURATION, DETERMINED THE RESOLUTION REQUIREMENTS FOR ANALYZING NSWC'S FRINGE DATA, DESIGNED THE SYSTEM'S SOFTWARE COMPONENTS, PROTOTYPED CRITICAL SOFTWARE COMPONENTS, AND DESIGNED ADVANCED FRINGE ANALYSIS TECHNIQUES TO SUPPORT THE ANALYSIS OF HIGH RESOLUTION FRINGE DATA AND THE USE OF PHASE SHIFT INTERFEROMETRY. IN PHASE II, KMSF WILL IMPLEMENT THE PHASE I HARDWARE AND SOFTWARE DESIGN. SPECIFICALLY, KMSF WILL DEVELOP AN ADVANCED DIGITAL FRINGE ANALYSIS WORKSTATION THAT HAS a) A HUMAN-ENGINEERED WORKSTATION INTERFACE, b) THE ABILITY TO EXTRACT FRINGE CONTOURS FROM CLOSELY SPACED FRINGES IN HIGH RESOLUTION FRINGE DATA, c) IMPROVE ABILITY TO DISTINGUISH FRINGE DATA FROM BACKGROUND ARTIFACTS AND NOISE, AND d) THE ABILITY TO USE AN ON-BOARD ARRAY PROCESSOR TO RAPIDLY PROCESS HIGH RESOLUTION FRINGE DATA.

KRAUSE P C & ASSOCS INC
1414 RAVINIA RD
WEST LAFAYETTE, IN 47906
CONTRACT NUMBER: M00027-88-C-0037
PAUL C KRAUSE
TITLE:
MODELING OF SHIPBOARD ELECTRIC POWER DISTRIBUTION SYSTEM
TOPIC# 14 OFFICE: ONT/DTRC IDENT#: 15599

DEVELOPMENT AND DEMONSTRATION OF A SOLID STATE LASER CAPABLE OF PRODUCING LIGHT AT A HIGH PULSE REPETITION RATE IN THE BLUE-GREEN NEAR-SHORE SEAWATER OPTICAL PENETRATION REGION (510-540-NM).

L.N.K. CORP INC
6811 KENILWORTH AVE - STE 306
RIVERDALE, MD 20737
CONTRACT NUMBER:
BARBARA D LAMBIRD
TITLE:
PARALLEL PROCESSING AND NEURAL NETWORKS FOR REAL-TIME
TARGET CLASSIFICATION
TOPIC# 147 OFFICE: NSWC IDENT#: 17789

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REAL-TIME CLASSIFICATION OF AIRBORNE TARGETS IS OF CRITICAL IMPORTANCE TO THE NAVY. WITH CONTINUING IMPROVEMENT IN SENSOR CHARACTERISTICS AND COMPUTER SOURCES, THIS GOAL BECOMES MORE REACHABLE. L.N.K. PROPOSES TO DEVELOP A PROTOTYPE AIRBORNE TARGET CLASSIFICATION SYSTEM USING RADAR CROSS SECTION DATA. THE SYSTEM WILL COMBINE AN L.N.K. MATCHING ALGORITHM WITH NEURAL NETWORK TECHNOLOGY TO PROVIDE FAST, ROBUST CLASSIFICATION. THE SYSTEM WILL ALSO INCORPORATE A STRUCTURAL PATTERN RECOGNITION APPROACH USING AN L.N.K. ARTIFICIAL INTELLIGENCE SEARCH TECHNIQUE. THIS TECHNIQUE ALLOWS FEEDBACK BETWEEN MODEL-DIRECTED AND DATA-DIRECTED SEARCHES TO OPTIMIZE THE EFFICIENCY OF THE CLASSIFICATION PROCESS. THE NEED TO DEVELOP A CLASSIFICATION SYSTEM WHICH CAN BE IMPLEMENTED IN HARDWARE WILL BE A PRIMARY CONSIDERATION IN PHASE II. ALL MAJOR COMPONENTS OF THE SYSTEM WILL MAKE EXTENSIVE USE OF PARALLELISM. BASED ON AN EARLIER AIRCRAFT CLASSIFICATION STUDY USING THE L.N.K. MATCHING ALGORITHM ON A RELATED FORM OF DATA, RELIABLE CLASSIFICATION APPEARS FEASIBLE. WE WILL TEST THE PROTOTYPE CLASSIFICATION ON SIMULATED RADAR RANGE PROFILES AND REAL DATA, AS AVAILABLE.

LASER POWER CORP
12777 HIGH BLUFF DR
SAN DIEGO, CA 92130
CONTRACT NUMBER: N60530-88-C-0130
DR DOUGLAS H TANIMOTO
TITLE:
FABRICATION AND PROTECTIVE COATING PROCESSES FOR ZnS AND ZnSe
SURFACES HAVING GREATLY REDUCED LEVELS OF SUBSURFACE DAMAGE
TOPIC# 172 OFFICE: NWC/NAVAIR IDENT#: 19332

DURING PHASE I OF THIS PROGRAM, WE HAVE DEVELOPED A SINGLE POINT DIAMOND TURNING PROCESS FOR PRODUCING SURFACES OF ZINC SELENIDE AND ZINC SULFIDE WHICH EXHIBIT VERY LOW LEVELS OF SURFACE AND SUBSURFACE DAMAGE. TO EXPLOIT THIS ADVANCE SO AS TO PRODUCE RAIN EROSION RESISTANT IR DOMES, IT IS PROPOSED THAT THE SCOPE OF THIS PREVIOUS WORK SHOULD BE EXPANDED AND SHOULD INCLUDE THE ADDITION OF DIAMOND-LIKE AR COATINGS TO THESE STRUCTURALLY SUPERIOR SURFACES. THE PROPOSED PROGRAM ENCOMPASSES A FURTHER REFINING OF THE SINGLE POINT DIAMOND TURNING PROCESS, TOGETHER WITH THE DEVELOPMENT OF DIAGNOSTIC

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TECHNIQUES WHICH WILL PROVIDE A QUANTITATIVE ASSESSMENT OF SUBSURFACE DEFECTS. CONCURRENTLY, THERE WILL BE A COATING PROGRAM TO DEVELOP MULTILAYER DIAMOND-LIKE PROTECTIVE COATINGS FOR ZINC SULFIDE. THE LATTER PORTION OF THIS PROGRAM WILL INTEGRATE THESE TWO FABRICATION TECHNOLOGIES TO PRODUCE HIGHLY CONVEX PROTECTED WINDOWS WHICH WILL UNDERGO RAIN EROSION TESTING.

LASER SCIENCE INC
26 LANDSDOWNE ST
CAMBRIDGE, MA 02139
CONTRACT NUMBER:
LARRY BERG
TITLE:
FREQUENCY STABILIZATION IN PULSED LASER WAVEFORMS
TOPIC# 30 OFFICE: SPAWAR IDENT#: 17756

AN ENGINEERING EFFORT IS PROPOSED AS PHASE II FOR THE DEVELOPMENT OF A PROCESS AND EQUIPMENT FOR USE IN FREQUENCY CONTROL OF PULSED LASERS TO ACHIEVE VERY HIGH FREQUENCY STABILITY, TO THE LIMIT GIVEN BY THE INVERSE OF THE PULSE DURATION. THERE EXISTS A VARIETY OF IMPORTANT LASER RADAR APPLICATIONS FOR WHICH ENERGETIC LASER PULSES ARE NEEDED AT A FREQUENCY STABILITY AT THIS LEVEL. THE EXISTING METHOD TO ACHIEVE SUCH HIGH STABILITY CONSISTS OF A MOPA CONFIGURATION IN WHICH THE OUTPUT OF A STABLE CW LASER IS AMPLIFIED IN A LARGE PULSED POWER AMPLIFIER BANK. THIS APPROACH SUFFERS FROM TWO MAJOR DRAWBACKS: LARGE SIZE AND INSTABILITY TO RETAIN THE FREQUENCY STABILITY IN THE PRESENCE OF THE INTENSE ACOUSTICS AND MICROPHONICS ENVIRONMENT IN AN AIRCRAFT. LSI'S PROPOSES "V"-PROCESSOR FOR PULSE LASER FREQUENCY CONTROL IS BASED ON AN ADAPTIVE PROCESS. THE "V"-PROCESSOR SENSES THE FLUCTUATIONS OF AN INCIDENT LASER PULSE AT ITS INPUT REFERENCED AGAINST A STABLE OPTICAL CLOCK. THE PROCESSOR REMOVES THE FLUCTUATIONS FROM THE SAME PULSE ELECTRO-OPTICALLY AT A DELAY TIME. IT ALSO ANCHORS THE PULSE FREQUENCY AT THE CLOCK FREQUENCY. THE PROPOSED ENGINEERING PHASE WILL DEVELOP A COMPLETE "V"-PROCESSOR OF THE FORM OUTLINED IN THIS PROPOSAL BASED ON DESIGN EFFORTS COMPLETED IN PHASE I.

LJF CORP
411 S LONDON AVE
EGG HARBOR, NJ 08215
CONTRACT NUMBER: N0429A-88-C-0058
JAMES L FOY
TITLE:
IR SEEKER TEST AND EVALUATION CENTER
TOPIC# 214 OFFICE: PMTC/NAVAIR IDENT#: 19056

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THE IR SEEKER TEST AND EVALUATION CENTER IS BASED ON THE LJF IR CRT. THIS PRODUCES GRAY-SCALE TRUE THERMAL IMAGES FROM VIDEO INPUTS SUCH AS FROM RECORDERS, COMPUTER IMAGE GENERATORS, CAMERAS, FLIRs AND SIMILAR SOURCES, IN REAL TIME. IT HAS A DELTA T CAPABILITY GREATER THAN 1000C, SPATIAL RESOLUTION EQUAL OR GREATER THAN 600 TV LINES, FRAME/FIELD RATES OF 30/60 OR GREATER, AND PROVIDES ESSENTIALLY GRAYBODY OUTPUT IN THE 3-5 AND 8-12 REGIONS OF THE IR SPECTRUM. WE WILL INTERFACE THE IR CRT OPTICALLY AND ELECTRICALLY TO BOTH THE DEVICE UNDER TEST AND TO THE SIGNAL SOURCE. A SHORT STUDY WILL DETERMINE FUTURE EXPANSION REQUIREMENTS. WE WILL PROVIDE THE IR CRT, OPTICAL COLLIMATOR, INTERFACE ELECTRONICS AND AN ISOLATED OPTICAL TABLE TO FURNISH THE NAVY WITH A TURNKEY TEST AND EVALUATION PROTOTYPE FACILITY. THIS WILL ALLOW YOU TO DEVELOP THE TEST AND EVALUATION PROCEDURES FOR FUTURE IR SEEKER-EQUIPPED MISSILES.

MASSA PRODUCTS CORP
280 LINCOLN ST
HINGHAM, MA 02043
CONTRACT NUMBER:
DONALD P MASSA

TITLE:
HYBRID PIEZOELECTRIC/MAGNETOSTRICTIVE SONAR TRANSDUCER ARRAY
TOPIC# 54 OFFICE: NAVSEA IDENT#: 16430

A HYBRID UNDERWATER SONAR TRANSDUCER ARRAY WHICH COMBINES BOTH MAGNETOSTRICTION AND PIEZOELECTRICITY, AS DESCRIBED IN U.S. PATENT 4,443,731 BY BUTLER AND CLARK, WILL BE DESIGNED, FABRICATED, AND EVALUATED DURING PHASE II. A SAMPLE HYBRID RESONATOR WAS BUILT AND TESTED DURING THE PHASE I CONTRACT. THE RESONATOR CONFIRMED THE THEORY OF OPERATION. THE RESPONSE SHOWS A REDUCTION IN FRONT-TO-BACK RATIO OF GREATER THAN 20 dB AS PREDICTED, AND HAD A SMOOTH VELOCITY RESPONSE. THE TRANSDUCER ALSO CONTAINED ELECTRICAL SELF-TUNING WHICH ELIMINATES COSTLY TUNING INDUCTORS AND TRANSFORMERS. A TRANSDUCER ARRAY YIELDING THESE USEFUL CHARACTERISTICS WILL BE DESIGNED, FABRICATED, AND MEASURED WITH THE AID OF THE TRANSDUCER DESIGN PROGRAM USED IN PHASE I.

MICRILOR INC
NINE LAKESIDE OFFICE PK
WAKEFIELD, MA 01880
CONTRACT NUMBER:
JOHN H CAFARELLA

TITLE:
SHORT-RANGE UNDERWATER COMMUNICATIONS
TOPIC# 196 OFFICE: NUSC IDENT#: 18223

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THE WORK ACCOMPLISHED UNDER PHASE I WILL CONTINUE AND WILL DEMONSTRATE RADIO TECHNIQUES WHICH CAN SUPPRESS INTERFERENCE AND ENABLE THE IMPLEMENTATION OF ANTIMULTIPATH TECHNIQUES.

MISSION SCIENCES CORP
6090 JERICHO TURNPIKE
COMMACK, NY 11725
CONTRACT NUMBER:
ARNOLD NOVICK
TITLE:
SHALLOW WATER SONAR SYSTEM
TOPIC# 50 OFFICE: NAVSEA IDENT#: 16410

THE TECHNICAL FEASIBILITY OF A SMALL SHIP SHALLOW WATER (SWAT) SONAR SYSTEM RELIABLY ACHIEVING 15 KILOYARD DETECTION RANGES IN ENVIRONMENTS OF OPERATIONAL INTEREST WAS DEMONSTRATED IN PHASE I. AN AT-SEA PROOF-OF-CONCEPT DEMONSTRATION IS PLANNED FOR PHASE II USING A PARTIAL SWAT SONAR SYSTEM. PERFORMANCE VALIDATION WILL BE ACCOMPLISHED BY CONDUCTING EXPERIMENTS AT MULTIPLE SHALLOW WATER SITES. ACOUSTIC AND SIGNAL PROCESSING MODELS WILL BE VALIDATED BY ANALYZING THE DATA ACQUIRED. EXTRAPOLATION OF THE AT-SEA RESULTS USING THE VALIDATED MODELS WILL PROVE THE PERFORMANCE OF A FULL SWAT SONAR SYSTEM.

MSB SYSTEMS INC
50 WASHINGTON ST
NORWALK, CT 06854
CONTRACT NUMBER:
BERNARD LICHTENSTEIN
TITLE:
BROADBAND TRANSDUCER/AMPLIFIER TECHNIQUE: NEGATIVE
IMPEDANCE CONVERTER (NIC)
TOPIC# 45 OFFICE: NAVSEA IDENT#: 16352

THIS PROPOSAL OUTLINES A TWO-YEAR SBIR PHASE II PROGRAM TO FABRICATE AND TEST A SET OF NEGATIVE IMPEDANCE CONVERTERS (NIC) TO

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WORK WITH AN ARRAY OF FLEXTENSIONAL TRANSDUCERS SPECIFIED IN THE PHASE I STUDY. THE PRIMARY OBJECTIVE IS TO DEMONSTRATE THE ABILITY OF THE NIC TO EXPAND THE TRANSDUCER OPERATIONAL BANDWIDTH TO 2 OCTAVES AT FULL INPUT POWER AND HIGH EFFICIENCY. THE AMPLIFIER WILL HAVE THE CAPACITY TO DELIVER 1000 WATTS PULSE AVERAGE, AT A 15% DUTY CYCLE. THE NIC WORKING WITH THIS SYSTEM WILL DELIVER 100 KVA, PULSE AVERAGE, ALSO AT A 15% DUTY CYCLE.

MSNW INC

PO BOX 865

SAN MARCOS, CA 92069

CONTRACT NUMBER:

DR GEORGE H REYNOLDS

TITLE:

IMPROVING THE UNIFORMITY OF CHEMICAL VAPOR INFILTRATION OF HfC AND HfB2 INTO FIBER PREFORMS

TOPIC# 136 OFFICE: NSWC

IDENT#: 17775

THE PHASE I RESEARCH DEMONSTRATED THE FEASIBILITY OF USING ALTERNATIVE PRECURSOR SPECIES AS A TOOL TO INFLUENCE AND IMPROVE THE UNIFORMITY OF INFILTRATION OF HfC AND HfB(2) INTO CARBON FIBER PREFORMS. THE PROPOSED PHASE II RESEARCH WILL DEMONSTRATE, ON THE SEMIPILOT SCALE, THE IMPROVED PROCESSES FOR CHEMICAL VAPOR INFILTRATION OF HfC AND HfB(2), ESTABLISH AND VALIDATE PROCESS MODELS, FULLY CHARACTERIZED THE PRODUCED MATERIAL VARIATIONS, AND PROVIDE SPECIMEN MATERIALS TONSWC FOR INDEPENDENT EVALUATION OF PROPERTIES. THE PRODUCT METHODOLOGIES ARE EXPECTED TO BE USEFUL FOR SYNTHESIS A VARIETY OF REFRACTORY CERAMIC MATRIX COMPOSITE SYSTEMS. CURRENTLY, USE OF SUCH SYSTEMS ARE CONTEMPLATED FOR ADVANCED TURBOJET ENGINE EXHAUST COMPONENTS, HYPERSONIC VEHICLE LEADING EDGES, RAMJET COMBUSTORS AND STRUCTURAL COMPONENTS FOR HYPERSONIC MISSILES.

MULTISPEC CORP

25 BLACK LATCH LN

CHERRY HILL, NJ 08003

CONTRACT NUMBER:

DR DAVID SHEBY

TITLE:

BROADBAND ACOUSTIC CHARACTERIZATION THROUGH SOURCE DECOMPOSITION USING MULTISPECTRAL ANALYSIS TECHNIQUES

TOPIC# 31 OFFICE: NOSC

IDENT#: 17757

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DEVELOPMENT AND APPLICATION OF METHODOLOGY FOR BROADBAND CHARACTERIZATION OF UNDERWATER ACOUSTIC SIGNALS BASED ON MULTISPECTRAL MEASUREMENTS. THESE MEASUREMENTS EXPLOIT INTRINSIC NONLINEAR DYNAMIC CHARACTERISTICS OF UNDERWATER ACOUSTIC SOURCES FOR THE PURPOSE OF DETECTION/CLASSIFICATION. THIS NOVEL METHODOLOGY IS UNPUBLISHED AND PROPRIETARY OF MULTISPEC CORPORATION.

NKF ENGINEERING INC
12200 SUNRISE VALLEY DR
RESTON, VA 22091
CONTRACT NUMBER:
DR MICHAEL P PAKSTYS
TITLE:
PROPEX (PROPELLED PENETRATION AND EXPLOSION) ENHANCED
UNDERSEA WARHEAD
TOPIC# 21 OFFICE: ONT/NSWC IDENT#: 15648

PHASE II OF THE DEVELOPMENTS OF AN ARMOUR PIERCING PROJECTILES TO PERFORATE DOUBLE-HULLED UNDERWATER SUBMARINE TARGETS IS PROPOSED. THE PROJECTILE VELOCITY NEEDED TO PERFORATE THE TARGET IS OBTAINED USING AN INNOVATIVE PROPULSION CONCEPT. THE WARHEAD WILL BE DELIVERED USING A STANDARD SIZE TORPEDO AND UPON IMPACT, WILL BE ACCELERATED TO THE NECESSARY VELOCITY. PHASE II WILL CONSIST OF THE DEVELOPMENT OF A DETAILED PROTOTYPE DESIGN. SCALE MODEL TESTING WILL BE CARRIED OUT TO DEMONSTRATE THE CONCEPT. THE COMPLETE PHASE I HAS ESTABLISHED BY COMPUTER SIMULATIONS THE FEASIBILITY OF THE CONCEPT AND HAS RESULTED IN A CONCEPTUAL DESIGN OF THE PROPEX WARHEAD.

NKF ENGINEERING INC
4200 WILSON BLVD - STE 1000
ARLINGTON, VA 22203
CONTRACT NUMBER:
JOHN EDYVANE
TITLE:
UNMANNED SHIP FIRE PROTECTION AND MANAGEMENT SYSTEM
TOPIC# 247 OFFICE: DTNSRDC IDENT#: 15990

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THE OBJECTIVE OF THIS PHASE II PROJECT IS TO INTRODUCE INDUSTRIAL ARM-TYPE ROBOTIC APPLICATIONS INTO THE NAVAL ENVIRONMENT. THROUGH THE INNOVATIVE INTEGRATION OF A VARIETY OF SENSORS (SPECIFICALLY LOW LEVEL IR) WITH A PROPERLY MODIFIED ROBOT ARM, AND THE USE OF AN EXPERT SYSTEM CONTROLLER, THIS DEVICE WILL PERFORM BOTH CRITICAL MONITORING FUNCTIONS AND SENTRY DUTY IN COMPLEX COMPARTMENTS. THE ROBOT ARM WILL USE ITS FULL RANGE OF MOVEMENT TO ENABLE A SINGLE SENSOR PACKAGE TO SEE ALL THE CRUCIAL AREAS AND EQUIPMENT IN A CROWDED SPACE WITHIN A SHIP. EXPERIMENTS WILL BE CONDUCTED TO ASCERTAIN NORMAL AND PRECOMBUSTION HEAT PATTERNS OF EQUIPMENT WITHIN A COMPARTMENT, PARTICULARLY SELECTED ELECTRICAL EQUIPMENT AND POWER PANELS. THE SYSTEM WILL BE DEMONSTRATED AS A PROOF-OF-CONCEPT DESIGN FOR AN UNMANNED FIRE PROTECTION AND MANAGEMENT SYSTEM.

OMNI ANALYSIS

9663 TIERRA GRANDE - STE 304

SAN DIEGO, CA 92126

CONTRACT NUMBER:

RICHARD D HASKELL

TITLE:

PROTOTYPE GENERALIZED INTERACTIVE MINEFIELD EVALUATION MODEL

TOPIC# 88 OFFICE: NAVSEA IDENT#: 16923

SOFTWARE WILL BE DEVELOPED IN PHASE II WHICH DEMONSTRATE THE MINEFIELD EVALUATION MODEL INITIATED IN PHASE I.

OPTIVISION INC

2655 PORTAGE BAY AVE - STE 1

DAVIS, CA 95616

CONTRACT NUMBER:

DANIEL G HARRINGTON

TITLE:

COLOR VIDEO COMPRESSOR FOR TELEMETRY

TOPIC# 168 OFFICE: NWC/NAVAIR IDENT#: 19309

THIS IS A PHASE II SBIR PROPOSAL FOR THE DEVELOPMENT OF A COLOR

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VIDEO REAL-TIME DATA COMPRESSION SYSTEM. THE PROPOSED SYSTEM WILL CONTAIN A TRANSMITTER AND A RECEIVER. THE TRANSMITTER WILL ACCEPT AN NTSC STANDARD COLOR VIDEO SIGNAL, DIGITIZE IT, COMPRESS IT IN REAL-TIME, AND ENCODE IT FOR TRANSMISSION AT USER-SELECTABLE RATES RANGING FROM 5 Mb/s TO 45 Mb/s. THE RECEIVER WILL DECODE AND DECOMPRESS THE DIGITAL BIT STREAM AND RECONSTRUCT THE DIGITIZED VIDEO SIGNAL FOR DISPLAY. THE PROPOSED SYSTEM WILL BE IMPLEMENTED SUCH THAT i) IT IS DOWNWARD COMPATIBLE WITH THE HORACE STANDARD BASED NWC 2421 AND NWC 2422 SPECIFICATION FOR MONOCHROME RD 170 VIDEO AND ii) THE COLOR PROCESSOR MODULE WILL BE AN ADD-ON MODULE TO THE MONOCHROME CODEC TO CONVERT IT TO A COLOR CODEC. THE SPECIFICATION OF THE RESULTANT COLOR CODEC SHOULD SERVE AS THE INITIAL DRAFT FOR THE FINAL STANDARD FOR DIGITAL TRANSMISSION OF COLOR IMAGES.

OPTOMECH DESIGN CO
PO BOX 619
LOS ALAMOS, NM 87544
CONTRACT NUMBER:
THOMAS A SWANN
TITLE:
ROTARY JOINT FOR SINGLE-MODE OPTICAL FIBER
TOPIC# 237 OFFICE: NOSC/NAVSEA IDENT#: 18303

A ROTARY JOINT FOR SINGLE-MODE OPTICAL FIBERS IS REQUIRED IN ORDER TO REALIZE THE FULL BENEFITS OF SINGLE-MODE FIBER DATA TRANSMISSION IN SOME APPLICATIONS. ROTARY JOINTS HAVE BEEN BUILT FOR MULTI-MODE FIBERS USING GRADIENT INDEX (GRIN) ROD LENSES WITH THE FIBERS HELD IN POSITION WITH ADHESIVES. DUE TO THE RELATIVELY HIGH COEFFICIENT OF THERMAL EXPANSION OF ADHESIVES, THE OPTICAL PERFORMANCE OF THESE JOINTS SUFFERS BADLY WHEN THEY ARE USED AT OTHER THAN ROOM TEMPERATURE. THE MILITARY ENVIRONMENT REQUIRES THAT A ROTARY JOINT BE ABLE TO WITHSTAND WIDE TEMPERATURE RANGES WITHOUT SEVERE OPTICAL PERFORMANCE DEGRADATION. DURING PHASE I, OPTOMECH DEMONSTRATED THE FEASIBILITY OF ATTACHING SINGLE-MODE OPTICAL FIBERS TO GRIN LENSES VIA A FUSION BONDING PROCESS WHEREIN THE GLASSES OF THE FIBER AND LENS ARE ACTUALLY FUSED TOGETHER. FOR PHASE II, OPTOMECH PROPOSES TO DESIGN, FABRICATE, AND ENVIRONMENTALLY TEST COMPLETE ROTARY JOINTS. THE FINAL HARDWARE DELIVERABLE FOR THE PROGRAM WOULD BE

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THREE ROTARY JOINTS.

ORINCON CORP
3366 N TORREY PINES CT - STE 300
LA JOLLA, CA 92037
CONTRACT NUMBER:
DR GERALD M ANDERSON
TITLE:
A MORE EFFECTIVE NAVIGATION MODEL FOR INTERDICTIONS OF EVASIVE
TARGETS
TOPIC# 65 OFFICE: NAVSEA IDENT#: 16466

PHASE II WILL PRODUCE AN EFFECTIVE NAVIGATION MODEL FOR INTERDICTION
OF EVASIVE TARGETS.

OSBORNE A ASSOCS INC
756 LAKEFIELD RD - BLDG J
WESTLAKE VILLAGE, CA 91361
CONTRACT NUMBER:
ANDREW BAZELEY
TITLE:
WATERSIDE SECURITY ROBOTICS/URV ATLAS SYSTEM
TOPIC# 235 OFFICE: NOSC/NAVSEA IDENT#: 18293

THE PRIMARY TECHNICAL OBJECTIVE OF THE PHASE II PROJECT IS TO
DEMONSTRATE THE FEASIBILITY OF USING AN UNDERWATER ROBOTIC VEHICLE
(URV) TO INTERCEPT PREVIOUSLY DETECTED WATERBORNE INTRUDERS AT
SUFFICIENT RANGE FROM CRITICAL U.S. NAVY ASSETS SO THAT POSITIVE
IDENTIFICATION CAN BE MADE AND SUITABLE RESPONSE ACTION CAN BE TAKEN
USING THE URV. IN THIS CAPACITY, THE URV WILL SERVE AS AN INTEGRAL
LINK IN THE WATERSIDE SECURITY SYSTEMS (WSS's) BEING DEVELOPED BY
N.O.S.C. IN ACCORDANCE WITH THE NAVY TENTATIVE OPERATIONAL REQUIRE-
MENT (TOR), WHICH ADDRESSES THE PHYSICAL SECURITY MEASURES USED TO
PROTECT AGAINST INTRUSIONS THROUGH THE WATER BOUNDARIES OF DEPARTMENT
OF DEFENSE INSTALLATIONS. A SECONDARY TECHNICAL OBJECTIVE OF THE
PROJECT IS TO ESTABLISH THE VIABILITY OF USING THE URV, CONFIGURED
WITH SUITABLE SENSOR SUBSYSTEMS, TO CARRY OUT THE PRIMARY INTRUDER

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DETECTION MISSION, THEREBY ENABLING TO SERVE AS A STAND-ALONE WATERSIDE SECURITY SOLUTION. IN THIS CAPACITY, THE URV WILL EXTEND THE DETECTION RANGE OF EXISTING SECURITY SYSTEMS, WILL BE CAPABLE OF AIRLIFT TO COUNTER REGIONAL HOSTILITIES AND WILL BE ABLE TO PROTECT MOORED VESSELS AND OTHER ASSETS NOT EQUIPPED WITH FIXED DETECTION SYSTEMS.

PHYSICAL DYNAMICS INC

PO BOX 1883

LA JOLLA, CA 92038

CONTRACT NUMBER:

PETER V CZIPOTT

TITLE:

MAGNETIC SYSTEM FOR LAUNCH TUBE LINEAR POSITION MEASUREMENTS

PHASE II: PROTOTYPE OPERATIONAL SYSTEM

TOPIC# 177 OFFICE: NWC/SSPO IDENT#: 19356

A NON-CONTACTING MEANS IS REQUIRED TO MEASURE CHANGES IN THE CLEARANCE BETWEEN THE SURFACE OF A MISSILE AND ITS LAUNCH TUBE DURING LAUNCH. THE MEASUREMENT MUST BE ACCURATE TO THE ORDER OF TWO PERCENT. RESULTS OF PHASE I WORK DEMONSTRATE THE FEASIBILITY OF A MAGNETIC MEANS TO MAKE THE MEASUREMENT. AN ARRAY OF SMALL BEADS OF PERMANENT MAGNETIC MATERIAL FIXED TO THE MISSILE GENERATE A DISTINCTIVE MAGNETIC SIGNATURE WHOSE STRENGTH, AS MEASURED BY MAGNETIC SENSORS, MOUNTED ON THE LAUNCH TUBE WALL, VARIES STRONGLY WITH DISTANCE TO THE WALL. ANALYTICAL CALCULATIONS SUCCESSFULLY PREDICT THE DISTANCE DEPENDENCE MEASURED IN TESTS USING A LABORATORY MOCKUP. AFTER COMPLETING PRELIMINARY MEASUREMENTS USED TO SET SPECIFICATIONS, WE PROPOSE TO DESIGN, FABRICATE, AND TEST A PROTOTYPE SYSTEM IN PHASE II WORK. LABORATORY TESTS WILL BE FOLLOWED BY SYSTEM INSTALLATION ON THE TEST LAUCH TUBE AT HUNTER'S POINT NAVAL SHIPYARD AND MEASUREMENTS DURING A TEST SHOT.

PHYSICAL SCIENCES INC

PO BOX 3100 - RESEARCH PK

ANDOVER, MA 01810

CONTRACT NUMBER:

MICHAEL B FRISH

TITLE:

VORTICITY OPTICAL PROBE

TOPIC# 9 OFFICE: ONR IDENT#: 17254

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THE PRIMARY GOALS OF THIS EFFORT ARE TO DEVELOP AND DEMONSTRATE THE FIRST-GENERATION OF A PROTOTYPE VORTICITY OPTICAL PROBE (VOP) INSTRUMENT WHICH PROVIDES WIDE APPEAL TO THE WATER FLOW RESEARCH COMMUNITY. THE PROPOSED WORK IS DIVIDED INTO THREE BASIC AND TWO ADVANCED TASKS. THE BASIC TASKS ARE: 1) DEVELOPMENT OF WATER-COMPATIBLE PROBE PARTICLES; 2) DESIGN, PACKAGING, CALIBRATION, AND CHARACTERIZATION OF THE OPTICAL SYSTEM WHICH WILL BE USED FOR SINGLE-POINT VORTICITY VECTOR MEASUREMENTS; AND 3) TESTING AND DEMONSTRATING THAT SYSTEM'S ABILITY TO MEASURE THE FULL SPECTRUM OF VORTICITY FLUCTUATIONS WITHIN A WELL-CHARACTERIZED TURBULENT WATER BOUNDARY LAYER. THE ADVANCED TASKS ARE INTENDED TO PARTIALLY DEVELOP A TECHNIQUE FOR SIMULTANEOUSLY MEASURING VORTICITY AND VELOCITY OVER AN EXPANDED AREA OR VOLUME BY: 1) ANALYTICALLY COMPARING VARIOUS TECHNIQUES WHICH HAVE BEEN IDENTIFIED AS HAVING POTENTIAL FOR MAKING HIGH-SPEED MULTI-POINT SIMULTANEOUS VORTICITY AND VELOCITY MEASUREMENTS, CULMINATING IN THE SELECTION OF ONE APPROACH WHICH HOLDS THE GREATEST PROMISE FOR SUCCESSFUL DEVELOPMENT; AND 2) ADDITIONAL RESEARCH AND DEVELOPMENT OF THE SELECTED TECHNIQUE.

POWERTRONIC SYSTEMS INC

PO BOX 29109

NEW ORLEANS, LA 70189

CONTRACT NUMBER:

CHARLES E THOMAS

TITLE:

ELECTRICAL FAULT CURRENT LIMITER

TOPIC# 15

OFFICE: ONT/DTRC

IDENT#: 15610

THE OBJECTIVE OF PHASE II IS TO DEMONSTRATE THE EFFECTIVENESS OF A SOLID-STATE ELECTRICAL FAULT CURRENT LIMITER DESIGNED IN ACCORDANCE WITH THE RESULTS OF THE PHASE I STUDY. IT IS PROPOSED THAT THE DEMONSTRATION BE ACCOMPLISHED BY TESTING A 200 AMPERE 60 HERTZ BRASSBOARD UNIT OF THE OPTIMUM DESIGN APPROACH. FEATURES OF THE BRASSBOARD CURRENT LIMITER WILL INCLUDE: 1) COMPLIANCE WITH FUNCTIONAL REQUIREMENTS DEFINED IN PHASE I, 2) FACILITATE ACQUISITION OF DATA ASSOCIATED WITH DEVELOPMENTAL TESTS, 3) PACKAGED TO ALLOW SHORE-BASED AND SHIPBOARD TESTING, AND 4) APPROXIMATION OF THE ANTICIPATED PRODUCTION UNIT PHYSICAL DESIGN. A TEST SET WILL BE

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DESIGNED AND FABRICATED FOR USE IN TESTING AT THE PSI FACILITY AND AT DTRC. IT WILL INCLUDE PROVISIONS FOR CONTROLLING TEST CONDITIONS AND FOR MONITORING THE CURRENT LIMITER PERFORMANCE. TESTS WILL BE PERFORMED ON THE CURRENT LIMITER TO VERIFY THAT FUNCTIONAL REQUIREMENTS ARE MET AND THAT ELECTRICAL AND THERMAL STRESSES ON COMPONENTS ARE CONSISTENT WITH RELIABILITY REQUIREMENTS. THE FINAL REPORT WILL INCLUDE DATA ON THE ABOVE TASKS AS WELL AS ANALYSIS OF ACTUAL-TO-SPECIFIED PERFORMANCE, AND PROJECTED CHARACTERISTICS OF PRODUCTION DESIGNS.

Q.S.D. INC
504 MONTEREY DR
APTOS, CA 95004
CONTRACT NUMBER:
ROBERT MURPHY
TITLE:
ADVANCED GENERAL PURPOSE CONTROLLER
TOPIC# 148 OFFICE: NSWC IDENT#: 17791

CURRENT CONTROLLER METHODOLOGY IS BASED ON THE PREMISE THAT REAL-TIME APPLICATIONS EXECUTE WITHIN WELL UNDERSTOOD LIMITS. THESE CONTROLLERS DO NOT ADDRESS PROBLEMS OF APPLICATION IN TARGET ENVIRONMENTS WHOSE LIMITS ARE NOT WELL KNOWN, WHERE HOST SYSTEMS ARE CUMBERSOME, WHERE PERFORMANCE REQUIREMENTS CHANGE, OR WHERE IN-CIRCUIT-EMULATORS ARE INADEQUATE. QSD SEEKS TO DEMONSTRATE ADVANCED CONTROLLER CONCEPTS AS THEY APPLY TO SENSORY UNDERSTANDING IN A NEURAL NETWORK. TECHNIQUES TO BE APPLIED INCLUDE: MULTIPLE STACK RISC ARCHITECTURE - MINIMUM HARDWARE WITH COMPACT CODE CLOSED CASE INSITU DEVELOPMENT - TARGET RESIDENT TOOLS ELIMINATE HOST HIGH SPEED INTER-PROCESSOR COMMUNICATION - DATA RATES OF 16M-BYTES PER SECOND SUPPORT THE FORMATION OF COMPLEX NETWORKS FOR SENSOR I/O. SINGLE CHIP INTEGRATION - FABRICATION OF AN ADVANCED CONTROLLER TO MINIMIZE POWER DISSIPATION, IMPROVE PERFORMANCE AND BRING ON-CHIP SOFTWARE TOOLS INTO PRACTICE TO FORM A CLOSED CASE ENVIRONMENT. FORTH - APPLY DIRECT-EXECUTION TO ACCELERATE PERFORMANCE.

QUANTUM DESIGN INC
11568 SORRENTO VALLEY RD - STE 15
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR RONALD E SAGER
TITLE:
AN ULTRA-SENSITIVE MAGNETIC MEASUREMENT SYSTEM FOR
EVALUATING CORROSION
TOPIC# 117 OFFICE: NSWC IDENT#: 17189

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RECENT EXPERIMENTS AT MASSACHUSETTS INSTITUTE OF TECHNOLOGY HAVE SHOWN THAT A NEW NONINVASIVE TECHNIQUE FOR MONITORING THE MAGNETIC FIELDS ASSOCIATED WITH ELECTROCHEMICAL CORROSION CURRENTS, CAN GIVE NEW INSIGHTS INTO THE FUNDAMENTAL PHYSICS OF CORROSION PROCESSES. HOWEVER, THE CURRENT RESEARCH IS BEING CONDUCTED WITH EQUIPMENT WHICH IS POORLY SUITED TO THESE PARTICULAR MEASUREMENTS. THE WORK IN PHASE I HAS PRODUCED A CONCEPTUAL DESIGN FOR AN IMPROVED INSTRUMENT SPECIFICALLY TAILORED FOR THESE MEASUREMENTS. THIS PHASE II PROPOSAL OUTLINES A PROGRAM TO FINISH DESIGNING AND CONSTRUCTING THE INSTRUMENT, COMPLETE WITH AUTOMATED CONTROL AND DATA COLLECTION TO FACILITATE THE RESEARCH ALREADY BEGUN AT MIT. SPECIFIC DESIGN CRITERIA FOR THE INSTRUMENT PROVIDE FOR IMPROVED SPATIAL RESOLUTION AND SENSITIVITY, IMPROVED RF IMMUNITY OVER EXISTING SYSTEMS, FREE ACCESS TO A CORROSION CELL OF SPECIAL DESIGN, AND AUTOMATION OF CONTROL AND DATA COLLECTION FUNCTIONS.

RADCON

60 MISSION DR
PLEASANTON, CA 94566

CONTRACT NUMBER:

WILLIAM V MOFFAT

TITLE:

HOSTILE IDENTIFICATION AND INTENT ASSESSMENT SYSTEM ("IDINT")

TOPIC# 112 OFFICE: NAVAIR/SC IDENT#: 16315

THE OPERATIONAL OBJECTIVE IS TO ALLOW EMPLOYMENT OF LONG/MEDIUM RANGE WEAPONS, IN THE SEA CONTROL MISSION, UNDER STRICT RULES OF ENGAGEMENT. THE TRAGIC LOSS OF LIFE INCIDENT WITH THE USS VINCENNES, POINTS OUT THE NEED FOR NOT ONLY RAPID POSITIVE TARGET "IDENT", BUT ALSO HOSTILE "INTENT" ASSESSMENT, BY THE NATURE OF THE HOSTILE'S ONBOARD EMISSIONS. THE SOLUTION MUST ALSO RECOGNIZE THE NEED FOR "EMCON" STEALTH, TO DEFEAT HOSTILE SURVEILLANCE SYSTEMS AND ANTI RADIATION MISSILES, WITH DECEPTION. WHAT IS NEEDED IS REAL TIME SENSING OF FUNDAMENTAL TO PURPOSE HOSTILE INFORMATION, REAL TIME EXPERT ENGAGEMENT DECISIONS AND ONBOARD RESOURCE MANAGEMENT ACTIONS. THE PROPOSED SOLUTION INTEGRATES RADCON DEVELOPED ECM/ECCM "SIGNATURE" FEATURE EXTRACTORS AND EXPERT LOGIC WITH A HOST WEAPON CONTROL RADAR AND ITS ASSOCIATED "ARTIS" NCTR PROCESSOR. THE

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RESOLUTION CORRELATES MULTISENSOR INFORMATION, PROVIDES REAL TIME
NCTR TARGET ASSESSMENT AND ADAPTIVE, REAL TIME INTELLIGENT DECISIONS
FOR EFFECTIVE WEAPON DELIVERY AND FORCE PROTECTION. IT IS PROPOSED
TO DEMONSTRATE THIS INTEGRATED PASSIVE/ACTIVE NCTR SYSTEM IN THE
NADC "TRISAT" ROOF-TOP TEST FACILITY, WARMINSTER PA.

RAMCOR INC
917 "B" INYOKERN RD
RIDGECREST, CA 93555
CONTRACT NUMBER: N60530-88-C-0160
MICHAEL D JACOBSON
TITLE:
VARIABLE FLOW GAS GENERATOR
TOPIC# 175 OFFICE: NWC/NAVSEA IDENT#: 19343

MODERN NAVY TACTICAL MISSILES REQUIRE AN EVER INCREASING ELECTRICAL
POWER LEVEL IN SMALLER MORE LIGHT WEIGHT PACKAGES. THIS IS
PARTICULARLY THE CASE FOR MISSILES THAT USE ACTIVE RF GUIDANCE AND
ELECTRICAL FIN CONTROL ACTUATORS. GAS GENERATOR DRIVEN TURBO
ALTERNATORS SHOW PROMISE OF MEETING THESE ADVANCED POWER SUPPLY
REQUIREMENTS WITH SIGNIFICANTLY IMPROVED PERFORMANCE RELATIVE TO
THERMAL BATTERIES. IN ORDER TO MEET THESE PERFORMANCE GOALS, BOTH
THE TURBINE AND GAS GENERATOR MUST HAVE HIGH PERFORMANCE. STUDIES
AND RESEARCH CONDUCTED IN PHASE I OF THIS EFFORT SHOWS THAT IT IS
POSSIBLE TO USE CONVENTIONAL GAS GENERATORS AND CONTROL TECHNIQUES
TO PROVIDE VARIABLE FLOW RATE. THIS TECHNOLOGY CAN BE USED TO MATCH
THE GAS GENERATOR FLOW TO THE POWER DEMAND OF THE SYSTEM TO LIMIT
WASTE OF THE GAS GENERATOR OUTPUT. THIS PHASE II EFFORT IS PROPOSED
TO CONTINUE THE INVESTIGATION OF CONTROLLED VARIABLE FLOW GAS
GENERATORS AND TO CONDUCT THE SUB SYSTEM INTEGRATION AND TESTING OF
A VARIABLE POWER SUPPLY SUBSYSTEM. THE STATE OF TECHNOLOGY IN
SEVERAL CRITICAL AREAS WILL BE TOTALLY ASSESSED WITH RESPECT TO
CONTROLLING THE GAS GENERATOR FLOW. THE REQUIRED INTERFACE WILL BE
RESOLVED SO THAT THE COMPONENTS CAN BE ASSEMBLED AND TESTED.

RESEARCH OPPORTUNITIES INC
2200 AMAPOLA CT - STE 101
TORRANCE, CA 90501
CONTRACT NUMBER:
WILLIAM C RILEY
TITLE:
COMPOSITE MATERIALS FOR ELECTRONIC DEVICES
TOPIC# 11 OFFICE: ONT IDENT#: 15577

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THE PHASE I RESULTS SHOWED THAT COMPOSITE MATERIALS INCORPORATING HIGH THERMAL CONDUCTIVITY GRAPHITE FIBERS COULD BE TAILORED TO MEET THERMAL EXPANSION AND THERMAL CONDUCTIVITY REQUIREMENTS FOR HEAT SINKS IN NAVY ELECTRONIC DEVICES. PHASE II WILL DEVELOP SELECTED COMPOSITES FOR COMPLETE EVALUATION AND PERFORMANCE DEMONSTRATION IN ACTUAL ELECTRONIC DEVICES INCLUDING SEM E AND POSSIBLY MIMIC. CANDIDATE COMPOSITES WILL INCLUDE GRAPHITE-ALUMINUM, AND GRAPHITE-COPPER SHOWN TO BE BEST FOR WEIGHT LIMITED APPLICATIONS AND VOLUME LIMITED SITUATIONS RESPECTIVELY. GRAPHITE REINFORCED ORGANIC MATRIX COMPOSITES (CONTAINING SOME METAL TO INCREASE THERMAL EXPANSION) WILL ALSO BE EVALUATED. EXPLORATORY STUDIES OF AN INTEGRAL HEAT SINK/DIELECTRIC COMPOSED OF GRAPHITE FIBERS IN ALUMINUM NITRIDE WILL BE UNDERTAKEN.

RESEARCH OPPORTUNITIES INC
2200 AMAPOLA CT - STE 101
TORRANCE, CA 90501
CONTRACT NUMBER:
WILLIAM C RILEY
TITLE:
METAL MATRIX COMPOSITE HEAT SINKS FOR ELECTRONIC DEVICES
TOPIC# 124 OFFICE: NSW IDENT#: 17496

THE PHASE I RESULTS SHOWED THE FEASIBILITY OF FABRICATING METAL MATRIX COMPOSITES (MMC) HEAT SINKS THAT WOULD PROVIDE WEIGHT-SAVING OF A FACTOR OF 3 OVER CURRENTLY USED HEAT SINK MATERIALS IN ELECTRONIC DEVICES. PHASE II WILL SELECT AN ELECTRONIC DEVICE UNDER DEVELOPMENT FOR A FUTURE NAVY SYSTEM AND DEVELOP MMC HEAT SINKS THAT WILL MEET ITS SPECIFIC REQUIREMENTS. THIS WILL INCLUDE AN ARCHITECTURE STUDY TO OPTIMIZE THE COMPOSITE STRUCTURE, AND A PRELIMINARY EVALUATION OF FABRICATION PROCESSES BASED ON THERMAL AND MECHANICAL PROPERTIES. PROMISING PROCESSES WILL BE SELECTED FOR FUTURE DEVELOPMENT AND WILL BE EVALUATED RELATIVE TO DEVICE REQUIREMENTS. INCLUDED WOULD BE CORROSION BEHAVIOR, DAMPING AND DIMENSIONAL SPECIFICATIONS SUCH AS SURFACE ROUGHNESS. THERMOGRAPHY WOULD BE USED TO DETERMINE HEAT FLOW CHARACTERISTICS. REPRODUCIBILITY OF CRITICAL PROPERTIES WILL BE DETERMINED. THE BEST COMPOSITES WILL BE UTILIZED IN AN ACTUAL ELECTRONIC DEVICE TO PROVE THE WORTH OF

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THE CONCEPT AND TO PROJECT THE BENEFITS FOR FUTURE NAVY SYSTEMS.

SCHMITT TECHNOLOGY ASSOCS
25 SCIENCE PK
NEW HAVEN, CT 96511
CONTRACT NUMBER:
DR BRET L HALPERN
TITLE:
SUPERSONIC GAS JET GENERATION OF PASSIVATING FILMS
MULTICOMPONENT OXIDE FILMS AND ULTRAFINE PARTICLES
TOPIC# 8 OFFICE: ONR IDENT#: 17253

IT IS PROPOSED TO USE SUPERSONIC GAS JET DEPOSITION IN SEVERAL APPLICATIONS. THE FIRST IS TO DEPOSIT THIN PASSIVATING OXIDE OR NITRIDE FILMS ON HEAT SENSITIVE SUBSTRATES. THE TECHNIQUE PERMITS US TO COAT SURFACES AT HIGH RATE AND AT LOW TEMPERATURES. AN APPLICATION OF PARTICULAR INTEREST IS THE PROTECTION OF HgCdTe INFRARED DETECTORS IN ORDER TO INHIBIT Hg LOSS WITHOUT REDUCING RAIDATION SENSITIVITY. A VARIATION OF THE METHOD INVOLVES DEPOSITION OF METAL FILMS AND SUBSEQUENT OXIDATION WITH ATOMIC OXYGEN. WE PROPOSE TO DEVELOP THIS METHOD AS A GENERAL LOW TEMPERATURE MEANS OF FABRICATING MULTICOMPONENT METAL OXIDE FILMS. LASTLY, WE WILL USE GAS JET DEPOSITION TO GENERATE ULTRAFINE METAL PARTICLES (SEVERAL NANOMETER DIAMETER) IN BOTH THE GAS PHASE AND IN LIQUIDS, FOR USE AS POSSIBLE THIN LAYER INFRARED ABSORBERS.

SCIENTIFIC ENGINEERING INSTRUMENT INC
1275 KLEPPE LN - STE 14
SPARKS, NV 89431
CONTRACT NUMBER:
LARRY G YORI
TITLE:
PORTABLE AUTOMATIC RECEIVER TEST SYSTEM (PARTS)
TOPIC# 152 OFFICE: NSWC IDENT#: 17795

AN ANALYSIS OF FLEET OPERATIONAL MAINTENANCE STRUCTURES SUGGESTS AN IMPORTANT AN IMMEDIATE REQUIREMENT FOR A PORTABLE ELECTRONIC

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AUTOMATIC TEST EQUIPMENT (ATE) SYSTEM FOR GO/NO-GO SCREENING OF MICROWAVE RECEIVER UNITS AT INTERMEDIATE AND ORGANIZATIONAL MAINTENANCE ACTIVITIES. THIS REQUIREMENT CAN ONLY BE ADDRESSED BY ADVANCED MODULAR TEST INSTRUMENT ARCHITECTURES WHICH REDUCE SIZE, WEIGHT AND REDUNDANCY OVER CONVENTION RACK-AND-STACK SYSTEMS. A DC TO 18 GHz RECEIVER TEST SYSTEM BASED ON HIGHLY MODULAR TEST INSTRUMENTS AND ON AN ADVANCED GRAPHICS WINDOW TEST PROGRAM SOFTWARE GENERATION ENVIRONMENT IS PROPOSED. THE PORTABLE AUTOMATIC RECEIVER TEST SYSTEM (PARTS) CONTAINS A MICROWAVE INSTRUMENT UNIT (MIU), ANALOG INSTRUMENT UNIT (AIU), PROGRAMMABLE DC POWER UNIT (DCPU) AND 80386 BASED IBM PC-COMPATIBLE HOST COMPUTER UNIT (HCU). THE SYSTEM INCLUDES A MODULAR SPECTRUM ANALYZER TO 22 GHz, SYNTHESIZED SIGNAL SOURCE/TRACKING GENERATOR TO 18 GHz, MICROWAVE POWER METER, HIGH SPEED DIGITIZER, PROGRAMMABLE NOISE SOURCE, MICROWAVE SWITCHING MODULE, DMM, FUNCTION UTILIZES VISUAL PROGRAMMING AND AUTOMATIC CODE GENERATION, DOCUMENTATION AND MAINTENANCE FACILITIES.

SENTIENT SYSTEMS TECHNOLOGY INC
5001 BAUM BLVD
PITTSBURGH, PA 15213
CONTRACT NUMBER:
GARY KILIAN
TITLE:
LOW-COST HELMET MOUNTED EYE GAZE SENSOR
TOPIC# 262 OFFICE: NAVAIR/NATC IDENT#: 17739

DURING PHASE I, SENTIENT SYSTEMS TECHNOLOGY (SST) HAS DEMONSTRATED TO NAVY PERSONNEL THAT APPLICATION OF ITS LOW-COST, EYE GAZE SENSING TECHNOLOGY WILL RESULT IN A PRACTICAL, LOW-COST, HELMET MOUNTED EYE GAZE SENSING SYSTEM FOR USE THROUGHOUT THE DEPARTMENT OF DEFENSE. SST HAS CONSTRUCTED, AND DEMONSTRATED TO NAVY PERSONNEL, A LOW-COST, HELMET MOUNTED, EYE GAZE SENSING TESTBED. NATC PERSONNEL HAVE OPERATED THE WORKING PHASE I SYSTEM AND WERE EXTREMELY PLEASED WITH ITS OPERATION. FOR THIS PHASE II EFFORT, THE TECHNOLOGY DEVELOPED FOR SST'S EYE-TYPER PRODUCTS AND INNOVATIONS DEVELOPED DURING PHASE I WILL BE USED TO CONSTRUCT OPERATIONAL PROTOTYPES OF A LOW-COST, HELMET MOUNTED EYE GAZE SENSING SYSTEM. THE PROTOTYPES WILL BE EXTENSIVELY EVALUATED AT THE NAVAL AIR TEST CENTER AND THE RESULTS WILL AID DEVELOPMENT AND ULTIMATE DELIVERY OF PRODUCTION QUALITY

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DEVICES AT THE END OF THE CONTRACT. A LARGE DEFENSE CONTRACTOR HAS EXPRESSED INTEREST IN THIS TECHNOLOGY AND WILL BE A POTENTIAL PARTNER FOR PHASE III.

SINHA S & ASSOCS INC
PO BOX 11205
BURBANK, CA 91510
CONTRACT NUMBER: N60530-88-C-0029
SACH SINHA
TITLE:
DESIGN AND DEVELOPMENT OF ACCELERATION DRIVEN TRANSFORMER
TYPE ENERGY INTERRUPTOR
TOPIC# 170 OFFICE: NWC/NAVAIR IDENT#: 19324

THIS IS THE SECOND PHASE OF THE PROGRAM FOR DESIGN AND DEVELOPMENT OF AN ENERGY INTERRUPTOR WHICH PERMITS POWER TO THE FIRING CIRCUIT ONLY AFTER SPECIFIC CONDITIONS ARE MET. THE INTERRUPTOR USES A SPLIT-PHASE TRANSFORMER AS A BASIC ENERGY INTERRUPTION COMPONENT. THE INPUT TO THE TRANSFORMER IS CONTROLLED BY A CONTROL CIRCUIT COMPRISING OF AN ACCELEROMETER, A/D CONVERTOR AND A MICROPROCESSOR WHICH PROVIDES THE TRANSFORMER WITH A SIGNAL OF PREDETERMINED NATURE. THE SYSTEM ALSO CONSISTS OF TWO ELECTROCHEMICAL INERTIA SWITCHES WHICH ARE DRIVEN BY THE POST-LAUNCH ACCELERATION. THE SYSTEM MEETS THE REQUIREMENTS OF MIL-STD-1316C. IT IS A DESIGN WHICH COMBINES THE STATE-OF-THE-ART ELECTRONICS AND MECHANICAL LOCKING FEATURES REQUIRED BY MIL-STD-1316C. DURING THE SECOND PHASE, THE DEVICE WILL BE DESIGNED, FABRICATED AND TESTED FOR PERFORMANCE UNDER THE SPECIFICATION PROVIDED BY NAVAL WEAPON CENTER. AT THE END OF THE PROGRAM, FIVE PROTOTYPE UNITS WILL BE SUBMITTED TO NWC FOR FURTHER TESTING.

SOFTWARE CONSULTANTS INTERNATIONAL LTD
PO BOX 5712
KENT, WA 98064
CONTRACT NUMBER:
LAWRENCE PETERS
TITLE:
HARD REAL TIME DESIGN METHODOLOGY AUTOMATION
TOPIC# 125 OFFICE: NSWC IDENT#: 17502

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THE HARD REAL TIME DESIGN METHODOLOGY DEVELOPED IN PHASE I PROVIDES A MEANS OF ESTABLISHING TIMING ESTIMATES IN THE ANALYSIS AND DESIGN AS WELL AS DURING OPERATIONAL USE. THE METHODOLOGY REQUIRES AUTOMATED SUPPORT IN ORDER TO MAKE ITS USE COST EFFECTIVE. THE PHASE II EFFORT IS DIRECTED AT ENHANCING THE METHODOLOGY AND DEVELOPING AUTOMATED SUPPORT FOR ITS USE. THIS EXPERT SYSTEM ENABLES SOFTWARE ENGINEERS TO DETERMINE TIMING PERFORMANCE, SAFETY, AND RESOURCE AVAILABILITY FOR THE MODELLED SYSTEM UNDER VARIOUS CONDITIONS AND OPERATING STATES. IT MAKES THE EXPLORATION OF "WHAT IF" SCENARIOS INEXPENSIVE IN DEVELOPMENT AND LONG TERM MAINTENANCE AND USE.

SOFTWARE SYSTEMS DESIGN INC

3627 PADUA AVE
CLAREMONT, CA 91711

CONTRACT NUMBER:

DR THOMAS S RADI

TITLE:

AUTOMATIC CONVERSION OF REAL-TIME SOFTWARE REQUIREMENTS

TOPIC# 128

OFFICE: NSWC

IDENT#: 17767

THIS PHASE II EFFORT REFINES THE PHASE I EFFORT WHICH RESULTED IN A PROTOTYPE SET OF SOFTWARE TOOLS THAT PROVIDE A MECHANISM FOR AUTOMATICALLY CONVERTING A SET OF SOFTWARE REQUIREMENTS, INTO A PRELIMINARY TOP-LEVEL DESIGN STRUCTURE. THE PHASE II EFFORT WILL CONCENTRATE ON FOUR AREAS (1) THE REFINEMENT AND FURTHER DEVELOPMENT OF THE METHOD FOR AUTOMATICALLY CONVERTING SOFTWARE REQUIREMENTS TO A TOP LEVEL ADA DESIGN ARCHITECTURE, (2) THE EXPANSION OF THE METHODOLOGY TO ACCOMMODATE LANGUAGES OTHER THAN ADA, AND THE AUTOMATIC PRODUCTION OF TOP LEVEL DESIGNS IMPLEMENTED IN LANGUAGES OTHER THAN ADA, (3) THE EXPANSION OF THE TECHNIQUE TO ACCOMMODATE ADDITIONAL REQUIREMENTS ANALYSIS GENERATION SYSTEM, AND (4) IF PRACTICAL, THE VALIDATION OF THE METHODOLOGY AND THE TOOLS ON AN ACTUAL NAVY PROJECT. THE RESULTS OF THIS PHASE II EFFORT WILL PRODUCE A METHODOLOGY AND A SET OF SOFTWARE TOOLS THAT CAN AUTOMATICALLY CONVERT SOFTWARE REQUIREMENTS INTO A DESIGN ARCHITECTURE. THE TOOLS AND METHODOLOGY WILL BE SHOWN TO BE EQUALLY APPLICABLE TO IMPLEMENTATIONS IN LANGUAGE OTHER THAN ADA.

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SPACE POWER INC
621 RIVER OAKS PKWY
SAN JOSE, CA 95134
CONTRACT NUMBER:
J KENT KOESTER
TITLE:
PULSED LASER THICKNESS INSTRUMENT FOR SEA ICE
TOPIC# 58 OFFICE: NAVSEA IDENT#: 16445

THE EXPLORATORY PHASE I WORK ON PULSE LASER LIGHT INTERACTIONS WITH SIMULATED SEA ICE HAS LED TO THE DEFINITION OF A LASER BASED ICE THICKNESS INSTRUMENT FOR UNDERWATER APPLICATION. THE DIRECT DEMONSTRATION OF THE PULSE LASER ICE THICKNESS INSTRUMENT UNDER SIMULATED ARCTIC SEA ICE CONDITIONS IS PROPOSED FOR THE PHASE II EFFORT. UNDER THIS PROJECT, AN EXPERIMENTAL LASER ICE THICKNESS INSTRUMENT WITH FEATURES PROTOTYPE OF THE SUBMARINE APPLICATION WILL BE DEVELOPED. FOLLOWING AN EXTENSIVE LABORATORY CHECK-OUT THIS EQUIPMENT WILL BE INSTALLED AT THE NOSC ARCTIC ICE POOL FACILITY FOR A DIRECT PERFORMANCE EVALUATION. THIS INSTRUMENT IS BASED ON THE PULSED LASER INDUCED ICE "GLOW" EFFECT OBSERVED DURING PHASE I. THE WORKING INSTRUMENT INCLUDES A POWERFUL PULSED YAG LASER (OPERATING IN THE BLUE-GREE TRANSMISSION BAND), A SPECIAL INSTRUMENT MODULE WITH AN ARRAY OF FAST OPTICAL DETECTORS, AND COMPUTER CONTROLLED SIGNAL DETECTION. SUPPORT TECHNICAL OBJECTIVES INCLUDE THE DETERMINATION OF ICE OPTICAL RESPONSE WITH SUBNANOSECOND RESOLUTION, VERIFICATION OF THE INSTRUMENT DESIGN PARAMETERS, AND THE DEVELOPMENT OF ROBUST THICKNESS INVERSION ALGORITHMS. SUFFICIENT TEST EXPERIENCE AND DATA IS SOUGHT IN THE ARCTIC ICE POOL EXPERIMENTS FOR THE DESIGN OF A SUBMARINE BASED INSTRUMENT.

SPECIALTY PLASTICS INC
PO BOX 77011 - 15915 PERKINS RD
BATON ROUGE, LA 70879
CONTRACT NUMBER:
RICHARD H LEA
TITLE:
COMPOSITE PIPING SYSTEM
TOPIC# 248 OFFICE: DTNSRDC IDENT#: 15994

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A COMBINED EXPERIMENTAL AND ANALYTICAL STUDY IS PLANNED TO CONTINUE THE PROJECT STARTED UNDER PHASE-I TO DEVELOP ADVANCED COMPOSITE PIPE SYSTEMS FOR ON-BOARD SHIP APPLICATIONS. WORK COMPLETED IN THE PHASE-I PROGRAM INDICATED THE USE OF HIGH TEMPERATURE CURED EPOXY RESINS AND VINYL ESTER RESINS WITH FLEXIBILIZERS COMBINED WITH DIFFERENT ORIENTATION OF THE GLASS FIBER PATTERN IN THE PIPE WALL COULD SUBSTANTIALLY IMPROVE THE COMPRESSION, TENSION AND BENDING STRENGTH OF COMPOSITE PIPE. NEW MANUFACTURING EQUIPMENT WILL BE DESIGNED WHICH WILL PLACE THE REINFORCEMENT IN OPTIMUM POSITIONS TO WITHSTAND THE SEVERE EXTERNAL PRESSURE LOADINGS REQUIRED OF ON-BOARD SHIP PIPING SYSTEMS. NEW JOINING METHODS WILL BE DEVELOPED, AND TESTED UNDER TENSION/TORSIONAL LOADS. EXTENSIVE TESTING MEASURING FLAMMABILITY AND SMOKE/TOXICITY LEVELS WILL BE CONDUCTED IN CONJUNCTION WITH THE INSTITUTE FOR ENVIRONMENTAL STUDIES AT LOUISIANA STATE UNIVERSITY. DUAL WALL PIPE WILL BE MANUFACTURED TO DETERMINE COST EFFECTIVENESS IN AN EFFORT TO FURTHER IMPROVE IMPACT AND FIRE RESISTANCE. CONDUCTIVE PIPING SYSTEMS WILL BE DEVELOPED TOGETHER WITH TESTS METHODS TO MEASURE ELECTROSTATIC DISCHARGE (ESD). LOUISIANA STATE UNIVERSITY WILL CONDUCT THEORETICAL ANALYSIS ON MECHANICS OF COMPOSITE MATERIALS TO GUIDE RESEARCHES IN CURRENT AND FUTURE WORK.

SUNOL SCIENCES CORP

6400 VILLAGE PKWY

DUBLIN, CA 94568

CONTRACT NUMBER:

PETER C STUDT

TITLE:

PORTABLE TORQUEMETER FOR T56 SERIES TURBOSHAFT ENGINES

TOPIC# 258 OFFICE: NAVAIR/NATC IDENT#: 17725

A NEW TORQUEMETER CONCEPT FOR TURBOSHAFT ENGINES IS DEMONSTRATED BY PROTOTYPE DEVELOPMENT AND TEST. FOUR NEW TORQUEMETER CAPABILITIES ARE DEMONSTRATED: (1) CONTINUOUS DETERMINATION OF TORQUE TRANSMISSION SHAFT STRENGTH PROPERTIES. (2) SELF CALIBRATION. (3) DETERMINATION OF THE MAGNITUDE AND ORIGIN OF BOTH STEADY-STATE AND TIME-VARYING TORQUES APPLIED BY EITHER THE INPUT OR OUTPUT LOADS. (4) PRECISION OF ONE-PERCENT IN INDICATED STEADY-STATE AND TIME-

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VARYING TORQUES. THE PROTOTYPE IS DEVELOPED AS A PORTABLE TORQUE-METER FOR THE T56 SERIES TURBOSHAFT ENGINES; IT WILL BE AN EXACT PHYSICAL REPLACEMENT FOR THE CURRENT ASSEMBLY. PERFORMANCE IS DEMONSTRATED BY LABORATORY TESTS AND BY INSTALLATION ON AN ENGINE DURING DYNAMOMETER TESTS.

SYMETRIX CORP
1873 AUSTIN BLUFFS PKWY
COLORADO SPRINGS, CO 80918
CONTRACT NUMBER: N60921-88-C-0040
LARRY D McMILLAN
TITLE:
DEVELOPMENT OF FERROELECTRIC SOURCE MATERIALS AND
DEPOSITION SYSTEM
TOPIC# 140 OFFICE: NSWC IDENT#: 17780

IN PHASE I OF THE PRESENT CONTRACT WE DEVELOPED METHODS FOR PRODUCING LIQUID SOURCE FORMULATIONS FOR COMPLEX FERROELECTRIC THIN FILMS. IN PHASE II OF THIS WORK WE PROPOSE TO DESIGN, FABRICATE, AND TEST A NEW LOW PRESSURE DEPOSITION SYSTEM CAPABLE OF DEPOSITING FERROELECTRIC THIN FILMS USING LIQUID SOURCE MATERIALS OF OUR OWN DESIGN. THE DELIVERABLES SPECIFIED FOR PHASE II INCLUDE LIQUID FORMULATIONS, TEST DEVICES, SPECIFICATIONS, AND A PROTOTYPE DEPOSITION SYSTEM. OUR PRIMARY OBJECTIVE WITH PHASE II IS TO DEVELOP A PRODUCTION-WORTHY FERROELECTRIC THIN FILM PROCESS.

SYMETRIX CORP
1873 AUSTIN BLUFFS PKWY
COLORADO SPRINGS, CO 80918
CONTRACT NUMBER: N00164-87-C-0240
LARRY D McMILLAN
TITLE:
DEVELOPMENT OF FERROELECTRIC MEMORIES
TOPIC# 187 OFFICE: NWSC/SSPO IDENT#: 19148

IN PHASE I OF THE PRESENT CONTRACT WE FABRICATED* AND TESTED FERROELECTRIC, NONVOLATILE, RANDOM ACCESS MEMORIES (RAMS). USING

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SPUTTERED PZT OF 350 nm THICKNESS, WE DEMONSTRATED READ/WRITE VOLTAGES AS LOW AS 1.0 V, SWITCHING TIMES AS FAST AS 14 ns, A VERY WIDE TEMPERATURE RANGE OF OPERATION (-100 DEG C TO +200 DEG C OR GREATER), GOOD DATA RETENTION AND FATIGUE CHARACTERISTICS, AND EXTREME RADIATION HARDNESS (5 Mrad TOTAL DOSE; 2.6×10^{11} rad/sec DOSE RATE). HOWEVER,, THE TESTED PARTS CONSISTED OF SMALL (256-BIT) ARRAYS ON CMOS SILICON DECORDER/SUBSTRATES. IN PHASE II OF THIS WORK WE PROPOSE TO DESIGN, FABRICATE, TEST, AND ANALYZE LARGER (2 KILOBIT) ARRAYS ON RAD-HARD DECODER/SUBSTRATES. THE DELIVERABLES SPECIFIED FOR PHASE II CONSIST OF FIFTY FULLY PACKAGED 2K RAMs THAT ARE RAD-HARD AND MEET ALL OTHER MILITARY SPECIFICATIONS, TOGETHER WITH DOCUMENTATION DESCRIBING THEIR ARCHITECTURE, SWITCHING CHARACTERISTICS AS FUNCTIONS OF VOLTAGE AND TEMPERATURE, RADIATION HARDNESS TEST RESULTS, AND OTHER DETAILS OF ANALYSES AND TESTING. *FABRICATION WAS DONE ENTIRELY BY OUR SUBCONTRACTOR, RAMTRON CORPORATIONS.

SYNETICS CORP
80 MAIN ST
READING, MA 01867
CONTRACT NUMBER:
R A FASTRING
TITLE:
STANDARD BACKPLANE BUSES FOR NAVY TACTICAL HARDWARE
TOPIC# 69 OFFICE: NAVSEA IDENT#: 16489

SYNETICS PROPOSES TO SURVEY BOTH THE NAVAL REQUIREMENTS FOR, AND THE INDUSTRIAL/COMMERCIAL AVAILABILITY OF, RUGGIDIZED/MILITARIZED BOARDS, ENCLOSURES AND POWER SUPPLIES FOR THE OPEN-ARCHITECTURE VMEbus IEEE STANDARD BACKPLANE. SYNETICS ALSO PROPOSES TO PROCURE, INTEGRATE, PROGRAM, TEST AND BENCHMARK A STATE-OF-THE-ART HIGH-PERFORMANCE MULTIPROCESSOR COMPUTER USING A STANDARD NAVY BACKPLANE SELECTED BY THE NEXT GENERATION COMPUTER RESOURCES (NGCR) PROJECT OFFICE. THE INITIAL VERSION, CONFIGURED FROM ELEMENTS FROM A SINGLE VENDOR, WILL BE UPGRADED WITH ELEMENTS FROM MULTIPLE VENDORS TO DEMONSTRATE THE INTEROPERABILITY OF THE SELECTED OPEN-ARCHITECTURE BACKPLANE STANDARD.

SYSTEMS EXPLORATION INC
4141 JUTLAND DR
SAN DIEGO, CA 92117
CONTRACT NUMBER: M00027-88-C-0066
LEE R MARSH
TITLE:
TACTICAL WARFARE SIMULATION EVALUATION AND ANALYSIS
SYSTEM/AVIATION SYSTEM INTERFACE
TOPIC# 27 OFFICE: MARINE CORPS IDENT#: 15921

SUBMITTED BY

HISTORICALLY, THE PARTICIPATION OF THE MARINE AIR WING STAFFS IN TACTICAL EXERCISES HAS BEEN SEVERELY LIMITED DUE TO THE LACK OF ELECTRONIC INTERFACES BETWEEN THEIR C2 SYSTEMS AND THE EXERCISE CONTROL SYSTEM. THIS SBIR PHASE II EFFORT CONTINUES THE DEVELOPMENT OF SUCH AN INTERFACE. THIS DEVELOPMENT BEGAN AS AN SBIR PHASE I CONTRACT WHICH RESULTED IN THE PUBLICATION OF AN INTERFACE REQUIREMENTS SPECIFICATION. PHASE II WILL CULMINATE IN THE FULLY AUTOMATED, ELECTRONIC INTERFACE BETWEEN THE TWSEAS AND THE TACC SYSTEM. DATA WILL BE PASSED USING JCS M-SERIES MESSAGES WHICH WILL BE INPUT THROUGH ONE OF THE TACC SYSTEM'S TADIL-B PORTS. IN ORDER TO MAINTAIN A REAL TIME SIMULATION OF THE AIR OPERATIONS BEING EXERCISED, THE TWSEAS AIR FUNCTION WILL BE DISTRIBUTED TO A SPECIAL TWSEAS TERMINAL.

TAU CORP
485 ALBERTO WY - BLDG D
LOS GATOS, CA 95030
CONTRACT NUMBER:
DR PETER LOOMIS
TITLE:
FLIGHT TEST DATA FILTERING AND SMOOTHING
TOPIC# 255 OFFICE: NAVAIR/NATC IDENT#: 17704

AIRCRAFT TRACKING DATA OBTAINED FROM TEST RANGE SENSORS ARE INHERENTLY NOISY, AND OFTEN CONTAIN UNKNOWN BIASES. SMOOTHING TECHNIQUES ARE TYPICALLY USED TO REDUCE THE NOISE IN DERIVING TRAJECTORY POSITION ESTIMATES, TAKING ADVANTAGE OF KNOWLEDGE OF AIRCRAFT DYNAMICS. HOWEVER, OPERATIONAL AIRCRAFT EXPERIENCE DISCONTINUITIES IN ACCELERATION, SUCH AS AT TOUCHDOWN OR AT THE POINT OF WEAPONS RELEASE. THE PROCESS OF SMOOTHING OFTEN MASKS THESE TRANSITIONS, WHICH OCCUR AT TIMES UNKNOWN TO THE TRACKING EQUIPMENT. THIS PROBLEM IS WORSE WHEN REAL-TIME OR NEAR REAL-TIME TRACKING IS DESIRED. THIS PROPOSAL PRESENTS A SET OF ADAPTIVE EDITING AND FILTERING TECHNIQUES WHICH CAN CONCURRENTLY IDENTIFY TRANSITIONS, EDIT DATA OUTLIERS,, CALIBRATE OUT SENSOR BIASES, AND PROVIDE IMPROVED TRAJECTORY ESTIMATES IN BOTH REAL-TIME AND POST-PROCESSING MODES OF TRACKER OPERATION. THESE TECHNIQUES TAKE ADVANTAGE OF RECENT ADVANCES IN ROBUST KALMAN FILTERING TECHNIQUES FOR HANDLING

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MULTI-SENSOR INPUTS. DURING THE CONTRACT PERIOD THESE TECHNIQUES WILL BE REFINED, TESTED AND DEMONSTRATED. THE FINAL PRODUCT WILL BE A SOFTWARE PACKAGE THAT CAN BE INSTALLED IN AN OPERATIONAL TEST RANGE.

TECHNO-SCIENCES INC (OLD: SYSTEMS ENGR)

7833 WALKER DR - STE 308

GREENBELT, MD 20770

CONTRACT NUMBER:

CHARLES FLETCHER

TITLE:

SEA MULTIPATH FOR TRACKING RADARS

TOPIC# 164 OFFICE: JCMPO

IDENT#: 17752

THIS PHASE II PROPOSAL FOLLOWS UP TO THE PHASE I SBIR "SEA MULTIPATH MODELS FOR TRACKING RADARS." THE OBJECT OF THE PHASE I WORK WAS TO DEMONSTRATE THE INTEGRATION A PAIR OF MOVING PLATFORM OVER-WATER MULTIPATH MODELS. THESE MODELS ARE A PHENOMENAL LOGICAL MODEL DEVELOPED AT NRL AND A MEAN FIELD VECTOR SCATTERING MODEL BASED AS ASYMPTOTIC ANALYSIS OF THE SEA SURFACE. THE PHASE II WORK WILL EXPAND THIS IS SECOND-ORDER EFFECTS AND INCLUDE MODELS OF WHITE CAPS AND FREQUENCY AGILITY EFFECTS. CONSIDERED THROUGHOUT THE PHASE II EFFORT IS THE VALIDATION OF THE MODEL AGAINST DATA AND THE DESIGN OF EXPERIMENTS TO COLLECT SUCH DATA; PARTICULARLY THE VALIDATION OF MOVING PLATFORM EFFECTS.

TEXAS RESEARCH INSTITUTE

9063 BEE CAVES RD

AUSTIN, TX 78733

CONTRACT NUMBER: N00024-89-C-3865

DR CECIL M TELLER

TITLE:

IMPROVED TRANSDUCER PRODUCTION TESTING FOR RUBBER-TO-METAL BONDED JOINTS

TOPIC# 68 OFFICE: NAVSEA

IDENT#: 16484

THE OVERALL OBJECTIVE OF THIS PROJECT IS TO DEMONSTRATE A WORKING

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PROTOTYPE TRANSDUCER BOND INSPECTION SYSTEM CAPABLE OF OPERATING IN THE TRANSDUCER PRODUCTION ENVIRONMENT. THE PHASE I EFFORT DEMONSTRATED THE FEASIBILITY OF DETECTING RUBBER-TO-METAL DEBOND SITES IN TRANSDUCER HEADMASS ASSEMBLIES USING THE PHASE I TRI DETECTION PROBE. THE PROPOSED WORK INTEGRATES AN IMPROVED PROBE DESIGN WITH AN AUTOMATED TRANSDUCER INSPECTION SYSTEM CAPABLE OF PRODUCTION BOND//DEBOND MAPPING OF HEADMASS ASSEMBLIES AND RUBBER ENCAPSULATED SECTIONS OF TR-317 AND TR-330 SERIES TRANSDUCERS. THE SYSTEM CONFIGURATION INCLUDES AUTOMATED SCANNING OF THE TRANSDUCER, ELECTRONIC PROBE CONTROL, AND DISPLAY OF THE TRANSDUCER RUBBER-TO-METAL DEBOND LOCATIONS. DEVELOPMENT RISKS ARE CONSIDERED LOW AS THE TECHNOLOGIES REQUIRED FOR THE TRANSDUCER INSPECTION SYSTEM HAVE ALL BEEN PROVEN IN RELATED TRI NDE PROJECTS AND PHASE I FEASIBILITY DEMONSTRATION. ARRANGEMENTS HAVE BEEN MADE TO OBTAIN (GFE) TR-317R RUBBER-COVERED TRANSDUCERS FOR FINAL INSPECTION SYSTEM DEMONSTRATION TO NAVSEA AND OTHER INTERESTED ORGANIZATIONS. THE FINAL PROTOTYPE SYSTEM IS BEING DESIGNED TO BE FAST ENOUGH TO ACCOMMODATE ASSEMBLY LINE INSPECTION REQUIREMENTS.

THERMACORE INC
780 EDEN RD
LANCASTER, PA 17601
CONTRACT NUMBER:
NELSON J GERNERT
TITLE:
FLEXIBLE HEAT PIPE COLD PLATE
TOPIC# 191 OFFICE: NADC/NAVAIR IDENT#: 19100

FEEDBACK POSITIONING AND CONTROL OF ONE FLIGHT CONTROL HYDRAULIC ACTUATOR REQUIRES DOZENS OF WIRES BETWEEN THE ACTUATOR AND FLIGHT CONTROL COMPUTER. IT IS DESIRABLE TO REDUCE THIS WIRE COUNT BY INCORPORATING FEEDBACK LOOP CLOSURE AND REDUNDANCY MANAGEMENT ELECTRONICS ON OR WITHIN THE FLIGHT CONTROL ACTUATOR. A RELIABLE COOLING METHOD WILL EXTEND ACTUATOR ELECTRONICS LIFE BY A FACTOR THREE IN THIS ENVIRONMENT. THIS PROPOSAL DESCRIBES A PROGRAM TO DEVELOP FLEXIBLE HEAT PIPE COLD PLATES FOR THIS APPLICATION. THE ACTUATOR ELECTRONICS ARE TO BE MOUNTED ON THE COLD PLATE. THE WASTE HEAT IS TO BE TRANSFERRED TO A HEAT SINK VIA A FLEXIBLE HEAT PIPE INTEGRAL WITH THE COLD PLATE. THE BASIC TECHNOLOGY AND TECHNICAL

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FEASIBILITY WERE DEMONSTRATED IN PHASE I. THE PROPOSED PHASE II WORK IS BASED ON USING THE COLD PLATE AND FLEXIBLE HEAT PIPE TECHNOLOGY DEMONSTRATED IN PHASE I. IT COVERS DEFINITION OF REQUIREMENTS OF SEVERAL ACTUATOR MANUFACTURERS THROUGH ANALYSIS, FABRICATION, AND TEST OF DEMONSTRATION COLD PLATES. IF SUCCESSFUL, PRELIMINARY STEPS WILL BE TAKEN FOR INTEGRATING THE COLD PLATES INTO PRODUCTION HARDWARE.

TMT/TTI JOINT VENTURE
15202 PIPELINE LN
HUNTINGTON BEACH, CA 92649
CONTRACT NUMBER:
JOHN F FLORY
TITLE:
SYNTHETIC LINE HARDWARE
TOPIC# 223 OFFICE: NCEL/NAVFAC IDENT#: 20002

END FITTINGS AND OTHER "HARDWARE" THAT ARE USED FOR TERMINATING ANCHORING, GRIPPING OR HANDLING SYNTHETIC FIBER LINE ARE AN ESSENTIAL ELEMENT IN THE OPERATIONAL SUCCESS OF SYNTHETIC LINES. A LACK OF TECHNICAL DATA EXISTS IN THIS AREA IN REGARDS TO DESIGN, PERFORMANCE AND RELIABILITY. SIZE AND WEIGHT OF CURRENT "HARDWARE" RESULT IN LESS THAN OPTIMUM UTILIZATION OF HIGH PERFORMANCE SYNTHETIC LINES. THIS PHASE II EFFORT WILL BUILD ON THE POSITIVE RESULTS OF PHASE I IN IMPROVING THE PERFORMANCE OF TERMINATIONS IN LARGE SIZE (OVER 150 TONS). PROPRIETARY DESIGNS WILL BE TESTED FOR STRENGTH AND LONG TERM RELIABILITY.

VANCE SYSTEMS INC
3901-V CENTERVIEW DR
CHANTILLY, VA 22021
CONTRACT NUMBER:
L MICHAEL LUMPKIN
TITLE:
SYSTEM LEVEL AUTOMATED TEST EQUIPMENT
TOPIC# 126 OFFICE: NSWC IDENT#: 17508

THIS PROPOSAL DEFINES THE DEVELOPMENT OF THE SYSTEM LEVEL AUTOMATED

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TEST EQUIPMENT (SLATE) FOR THE ON-LINE MAINTENANCE OF DISTRIBUTED PROCESSING SYSTEMS BASED ON LOCAL AREA NETWORKS (LANs). THE SLATE IS A STAND-ALONE SUBSYSTEM WHICH PROBES THE SYSTEM THROUGH A LAN. THE SLATE PROVIDES THE OPERATOR WITH BOTH MANUAL AND AUTOMATIC DIAGNOSTIC TOOLS. THE MANUAL TOOLS ARE INTENDED FOR THE MORE EXPERIENCED OPERATOR. THE AUTOMATED TOOLS ARE BASED IN ARTIFICIAL INTELLIGENCE TECHNOLOGY, IN PARTICULAR THE EXPERT SYSTEM PARADIGM. THE AUTOMATED TOOLS CONSIST OF NUMEROUS EXPERT SYSTEMS DESIGNED TO AUTOMATICALLY DETECT AND ISOLATE FAULTS IN LAN-BASED SYSTEMS. THE EXPERT SYSTEMS USE A WIDE RANGE OF INFERENCING MECHANISMS INCLUDING FORWARD CHAINING RULES, BACKWARD CHAINING RULES, SCRIPT PROCESSING, AND PROCEDURAL PROCESSING. THE EXPERT SYSTEMS WILL USE TWO INNOVATIVE DEVICES TO INTERFACE WITH THE LAN. ONE IS A DATA COLLECTOR, WHICH COLLECTS DATA OF INTEREST FROM THE LAN, AND THE OTHER IS A TRAFFIC GENERATOR, WHICH INTERACTIVELY GENERATES TRAFFIC ON THE LAN.

VECTOR MICROWAVE RESEARCH CORP
1150 S WASHINGTON ST - STE 300
ALEXANDRIA, VA 22314

CONTRACT NUMBER:

RONALD T CRABB

TITLE:

LOW COST ELECTRONIC WARFARE SYSTEM FOR REMOTELY OPERATED
VEHICLES

TOPIC# 43

OFFICE: NAVSEA

IDENT#: 16329

DECOY SPATIAL SEPARATION NEGATES MANY ADVANTAGES ENJOYED BY MONOPULSE RADAR TECHNOLOGY. REMOTELY PILOTED VEHICLES HAVE VERY BOARD EW APPLICATIONS. PHASE I EMPHASIS WAS ON JAMMING PROTECTION FOR SURFACE NAVY SHIPS WITH THEIR UNIQUE CONSIDERATIONS - LARGE RCS, LIMITED SPEED/MANEUVERABILITY, SHORT WARNING TIMES, AND LONG ENGAGEMENT DURATIONS. A VERY EFFECTIVE AND PRACTICAL EW SYSTEM PAYLOAD WAS DEFINED. IT ADDRESSED THE USE OF DECOYS TO COUNTER BOTH TARGETING AND HOMING FUNCTIONS - ADVANCED THREAT TECHNOLOGY DICTATED THE REQUIREMENTS AND SYSTEM DESIGN. A VARIETY OF ECM TECHNIQUES WERE IDENTIFIED. DIGITAL MODELING INDICATED POTENTIAL EFFECTIVENESS OF THE NEWER TECHNIQUES. ANECHOIC CHAMBER BREADBOARD TESTING TO REFINE AND QUANTIFY SYSTEM NEEDS (CROSS RANGE MODULATIONS) AND SRES

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TESTING TO REFINE COUNTER-TARGETING REQUIREMENTS IS PLANNED DURING PHASE II. HARDWARE TESTING IS PERFORMED AT THE NAVAL RESEARCH LABORATORY. RANGE GATE STEALING WAVEFORMS ARE TO BE TESTED AGAINST A LIMITED SET OF RANGE TRACKERS, AND LABORATORY TEST RESULTS ARE EXPECTED TO CONFIRM THOSE OF PHASE I DIGITAL SIMULATION TESTS. COORDINATION IN THE FORM OF INFORMATION EXCHANGES WITH THREE DEVELOPERS OF CANDIDATE RPV PLATFORMS IS PLANNED TO BETTER DEFINE MECHANICAL, THERMAL, AND ELECTRICAL INTERFACES BETWEEN THE EW PAYLOAD AND THE PLATFORM.

VIA-SAT INC
6120 PASEO DEL NORTE - J-2
CARLSBAD, CA 92008
CONTRACT NUMBER:
MARK MILLER
TITLE:
A COMPACT COMMUNICATIONS ENVIRONMENT SIMULATOR
TOPIC# 254 OFFICE: NAVAIR/NATC IDENT#: 17695

THIS PROPOSAL DESCRIBES AN SBIR PHASE II PROGRAM TO DEVELOP A PROOF-OF-CONCEPT TEST-BED MODEL OF A COMPACT RF ENVIRONMENT SIMULATOR. THE OBJECTIVE OF THE PHASE II PROGRAM IS TO BUILD AND DEMONSTRATE A SIMULATOR PROVIDING UP TO 200 SIMULTANEOUS COMMUNICATIONS WAVEFORMS OF UP TO TEN DIFFERENT TYPES OVER A PORTION OF THE HF AND UHF BANDS. THE PHASE II HARDWARE WILL PROVE THE TECHNICAL CONCEPTS NEEDED TO BUILD A PHASE III SIMULATOR PROVIDING 2000 + SIMULTANEOUS EMITTERS COVERING FREQUENCIES FROM VLF TO MICROWAVE, IN A SINGLE 6 FOOT EQUIPMENT RACK. THE DELIVERABLE TEST BED SIMULATOR WILL PROVE TWO KEY CONCEPTS OF THE PROPOSED DESIGN: 1) THE CAPABILITIES OF VIA-SAT'S INNOVATIVE APPROACH TO GENERATING ARBITRARY EMITTER WAVEFORMS USING A COMPACT STATE-MACHINE, AND 2) THE UTILITY OF OUR PROPOSED MENU-DRIVEN OPERATOR INTERFACE FOR SIMULATOR CONFIGURATION, OPERATION, AND REAL-TIME SCENARIO MONITORING. THE PROPOSAL INCLUDES A PRESENTATION OF WORK PERFORMED UNDER PHASE I, A DESCRIPTION OF OUR UNDERSTANDING OF THE OVERALL POTENTIAL APPLICATIONS, A DESCRIPTION OF THE SIMULATOR ARCHITECTURE, AND DETAILED DESCRIPTIONS OF THE EMITTER MODULE DESIGN. THE PROPOSAL DISTINGUISHES BETWEEN THE LONG-TERM (PHASE III) CAPABILITIES OF THE PROPOSED APPROACH, VERSUS THOSE PROVIDED IN PHASE II.

SUBMITTED BY

WAGNER D H ASSOCS
894 ROSS DR - STE 205
SUNNYVALE, CA 94089

CONTRACT NUMBER:
DR JAMES R WEISINGER

TITLE:
DEVELOPING SEARCH PLANNING METHODS FOR OPTIMIZING ASYMMETRICAL
DETECTION PERFORMANCE

TOPIC# 47 OFFICE: NAVSEA IDENT#: 16401

THIS PROPOSAL ADDRESSES THE PROBLEM OF SEARCH PLANNING IN A NON-HOMOGENEOUS ENVIRONMENT. IN PARTICULAR, IT AIMS AT DEVELOPING AND IMPLEMENTING EVALUATION AND OPTIMIZATION TECHNIQUES THAT ACCOUNT FOR ASYMMETRICAL DETECTION PERFORMANCE IN TWO IMPORTANT TACTICAL TECHNIQUES PATROL BARRIER AND AREA CLEARANCE. THE PROPOSED WORK BUILDS ON SEVERAL NEW SEARCH PLANNING TECHNIQUES DEVELOPED DURING PHASE I. THESE INCLUDE A FLEXIBLE AND EFFICIENT BARRIER EVALUATION ALGORITHM AND A TACTICS OPTIMIZATION TECHNIQUE BASED ON THE "SEARCH EFFECTIVENESS MATRIX." THERE ARE FOUR MAIN OBJECTIVES FOR THE PROPOSED WORK: SEARCH PLANNING METHODOLOGY. TO EXTEND THE NEW TECHNIQUES DEVELOPED DURING PHASE I. COMPUTATIONAL FEASIBILITY: TO DEVELOP METHODS FOR REDUCING THE COMPUTATIONAL REQUIREMENTS ASSOCIATED WITH A NON-HOMOGENEOUS DETECTION ENVIRONMENT. EVASIVE THREAT: TO INVESTIGATE THE IMPACT OF ASSUMING THAT THE THREAT ALSO HAS ACCESS TO A DETAILED DETECTION MODEL. PROTOTYPE SEARCH TACTICS MODULE: TO CONSTRUCT A COMPUTER DECISION AID THAT DEMONSTRATES THE OPERATIONAL UTILITY OF THE NEW METHODOLOGIES. TAKEN TOGETHER, THESE FOUR OBJECTIVES SHOULD PROVIDE A SOLID BASIS FOR OUR PHASE II OBJECTIVES; THE CONSTRUCTION OF AN OPERATIONAL SEARCH PLANNING TOOL THAT OPTIMIZES ASYMMETRICAL DETECTION PERFORMANCE.

WAGNER D H ASSOCS
STATION SQUARE TWO
PAOLI, PA 19301

CONTRACT NUMBER:
DR BARRY BELKIN

TITLE:
FURTHER DEVELOPMENT OF AN ATTRIBUTED-BASED TRACKER-CORRELATOR
ALGORITHM

TOPIC# 167 OFFICE: JCMPO IDENT#: 17755

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WE PROPOSE TO CONTINUE OUR PHASE I RESEARCH INTO ATTRIBUTE-BASED CORRELATION AND TRACKING OF SURFACE TARGETS. DURING PHASE II WE WILL DEVELOP A PROTOTYPE CORRELATION AND TRACKING ALGORITHM (CTA) SUITABLE FOR USE AS PART OF A NEXT-GENERATION TOMAHAWK WEAPON CONTROL SYSTEM. THE TECHNIQUES DEVELOPED DURING THIS RESEARCH WILL ALSO BE APPLICABLE TO OTHER AREAS IN WHICH CORRELATION AND DATA FUSION ARE USED TO SUPPORT NAVAL OPERATIONS. BY "ATTRIBUTES" WE MEAN TARGET CHARACTERISTICS, OTHER THAN POSITION AND VELOCITY, WHICH ARE REPORTED BY SENSORS AND CAN BE USED TO CORRELATE REPORTS AND CLASSIFY TARGETS. DURING PHASE I WE DEVELOPED A SMALL-SCALE CTA, CALLED AMATCH, WHICH USED ELINT AND CLASSIFICATION ATTRIBUTES SUCH AS (IMPERFECTLY REPORTED) SHIP CLASS, PROPULSION TYPE, AND HULL NUMBER. USING THIS CTA, WE DEMONSTRATED THAT EFFECTIVE USE OF ATTRIBUTES DECISIVELY IMPROVED CORRELATION PERFORMANCE.

WAGNER D H ASSOCS INC
27 W QUEENS WY - STE 301
HAMPTON, VA 23669
CONTRACT NUMBER:
DR ROBERT H OVERTON
TITLE:
FACTOR ANALYSIS AND ALGORITHM DEVELOPMENT FOR COORDINATED
MULTI-PLATFORM ANTI-SHIP CRUISE MISSILE ENGAGEMENT
TOPIC# 162 OFFICE: JCMPO IDENT#: 17748

THE PROPOSED RESEARCH WILL SEEK TO DEMONSTRATE THE FEASIBILITY OF NEW, EFFECTIVE ENGAGEMENT PLANNING FUNCTIONS WHICH CAN BE IMPLEMENTED IN THE TOMAHAWK WEAPONS CONTROL SYSTEM. THESE FUNCTIONS WILL INCLUDE REALISTIC MOTION MODELS FOR HOSTILE SURFACE ACTION GROUPS, ALGORITHMS FOR COORDINATING LAUNCHES FROM MULTIPLE PLATFORMS, AND EVALUATION OF MANAGEMENT PLANS BASED ON PROBABILITY OF OVERALL MISSION SUCCESS. THEY WILL TAKE INTO CONSIDERATION THREAT DEFENSE, TOMAHAWK SURVIVABILITY, AND CONVENTIONAL WARHEAD EFFECTIVENESS. THE PRODUCT OF THIS EFFORT WILL BE DETAILED DESCRIPTIONS OF THE REQUIRED ALGORITHMS AND PROTOTYPE ENGAGEMENT PLANNING FUNCTION SOFTWARE. THE PHASE II APPROACH IS PARTLY AN EXTENSION OF THE TECHNIQUES DEVELOPED BY THE PROPOSER IN PHASE I TO MEASURE PROBABILITY OF SUCCESS OF A PROPOSED ENGAGEMENT IN TERMS OF MISSION OBJECTIVES, AND TO OPTIMIZE

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COORDINATED ATTACKS BASED ON THREAT DEFENSES AS WELL AS ON ACQUISITION OF TARGETS. THE ENGAGEMENT ANALYSIS SECTION OF THE PROPOSED PLANNING FUNCTION WILL UTILIZE ALGORITHMS DEVELOPED FOR THE TOMAHAWK/HARPOON ENGAGEMENT ANALYSIS MODEL (THEAM), WHICH MODELS BOTH THE ACQUISITION AND ATTACK PHASES OF CRUISE MISSILE ENGAGEMENTS.

WESTERN FILAMENT INC
4680 SAN FERNANDO RD
GLENDALE, CA 91204

CONTRACT NUMBER:

AL AMARO

TITLE:

SONOBUOY CABLES OF HIGH STRENGTH SPECTRA MATERIALS

TOPIC# 192 OFFICE: NADC/NAVAIR IDENT#: 19104

DURING PHASE II WE WILL BE CONTINUING OUR WORK TO IMPROVE ON THE BASELINE KEVLAR CABLE CONSTRUCTIONS. THIS WILL INCLUDE WORKING WITH THE ORIGINAL 375 AND 650 DENIER SPECTRA 1000 AND THE NEW 185 DENIER SPECTRA 1000. WE WILL LIMIT OUR WORK TO BRAIDED CONSTRUCTIONS AND SPECTRA 1000 MATERIAL. IN ADDITION WE WOULD PROPOSE PRODUCING PARALLEL CONSTRUCTIONS OF KEVLAR MATERIAL PRODUCED ON THE SAME EQUIPMENT WITH THE SAME MANUFACTURING TECHNIQUES TO ACHIEVE DIRECT COMPARISON OF MATERIALS. EXPERIMENTATION WITH BONDING OF SPECTRA AND TERMINATION OF SPECTRA WILL ALSO BE ADDRESSED. PRESENT TECHNIQUES AND METHODS OF TERMINOLOGY MAY NOT BE ADEQUATE TO MAKE SPECTRA CABLE A VIABLE OPTION. SOME PROGRESS IN THIS AREA HAS BEEN MADE, BUT ADDITIONAL RESEARCH IS REQUIRED.

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TOTAL NUMBER OF AWARDS: 113

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3C SYSTEMS INC
620 ARGYLE RD
WYNNEWOOD, PA 19096
CONTRACT NUMBER: 87-C-0363
MURRAY KORNHAUSER
TITLE:
IMPROVEMENT OF SMALL SCALE TESTING FOR EXPLOSIVE SENSITIVITY
TOPIC# 7 OFFICE: AFATL/MNE IDENT#: 16514

THE OVERALL PROBLEM IS TO DEVELOP THE TECHNOLOGY OF SMALL SCALE TESTING TO THE POINT THAT THE PROPERTIES OF NEW EXPLOSIVE FORMULATIONS MAY BE MEASURED AND USED TO PREDICT FULL SCALE MUNITION PERFORMANCE. IN PHASE I IT WAS FOUND THAT THIS APPROACH APPEARS FEASIBLE IN TERMS OF TWO MEASURABLE EXPLOSIVE PROPERTIES, A PRESSURE SENSITIVITY THRESHOLD ($P(c)$) AND AN ENERGY SENSITIVITY THRESHOLD ($E(c)=p(2)t/c(10)U$) WHICH MUST BOTH BE EXCEEDED FOR ENERGETIC REACTIONS TO OCCUR. FURTHER, IT WAS FOUND THAT ENOUGH SMALL SCALE TESTS EXIST, OR CAN BE DEVELOPED WITHOUT TOO MUCH DIFFICULTY, TO MEASURE THESE PROPERTIES OF EXPLOSIVES. SIMILAR BASIC PROPERTIES OF EXPLOSIVES THAT SHOULD BE EMPLOYED IN COMPUTER MODELS TO ACCOUNT FOR SHEAR AND FRICTION ENERGY INPUTS ARE NOT EASILY MEASURABLE AT PRESENT. PHASE II IS DESIGNED TO IMPROVE SPECIFIC SMALL SCALE E-P TESTS WITH THE OBJECTIVE OF CONFIGURING AN E-P FACILITY THAT CAN EFFICIENTLY EVALUATE EXPLOSIVE SENSITIVITY, AND TO DEVELOP COMPARABLE TECHNOLOGY OF SMALL SCALE TESTING FOR THE EFFECTS OF SHEAR AND FRICTION.

ACTA INC
24430 HAWTHORNE BLVD - STE 101
TORRANCE, CA 90505
CONTRACT NUMBER:
JON D COLLINS
TITLE:
SYSTEM/COST EFFECTIVENESS OF ADVANCED ICBM BASING
TOPIC# 204 OFFICE: BMO/MYSC IDENT#: 16749

THE STATED OBJECTIVE OF AF87-204 IS THE DEVELOPMENT OF ANALYTICAL TOOLS TO ASSESS CONCEPT DEFINITION AND PERFORMANCE CHARACTERISTICS

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FOR VARIOUS BASING MODES OF LAND-BASED ICBMS. THE PHASE I RESEARCH EFFORT CLEARLY DEFINED THE EXISTENCE OF THREE MUTUALLY SUPPORTING LEVELS OF ANALYTICAL DETAIL THAT ARE NECESSARY IN THE DEVELOPMENT OF THE APPROPRIATE ANALYSIS, SYNTHESIS AND OPTIMIZATION TOOLS FOR THIS WORK. THE RESEARCH ALSO DEMONSTRATED THAT THE CURRENT STATE OF THE ART OF SYSTEM EFFECTIVENESS/COST EFFECTIVENESS CALCULATION METHODOLOGIES IS RIPE FOR MERGING INTO A SINGLE COMPOSITE TOOL. THIS TOOL SHOULD BE ABLE TO: (1) SYNTHESIZE A SYSTEM CONCEPT; (2) EVALUATE AND OPTIMIZE THE CONCEPT THROUGH SYSTEM/COSTS EFFECTIVENESS CALCULATIONS; AND (3) COMPUTE THE ASSOCIATED RISKS ARISING FROM UNCERTAINTIES IN THE PERFORMANCE AND COST DATA BASED. THIS PHASE II PROPOSAL DESCRIBES THE ELEMENTS OF THE COMPOSITE TOOL AND DELINEATES THE SET OF TASKS THAT WILL RESULT IN A PROTOTYPE DEMONSTRATION PROGRAM. THE PROGRAM WILL BE ABLE TO PERFORM MULTIPLE CONCEPTS SYNTHESIS, CONCEPTS EVALUATION/OPTIMIZATION AND RISK EVALUATION.

ADVANCED COMPOSITE TECHNOLOGY INC
15097 W 44TH AVE
GOLDEN, CO 80403
CONTRACT NUMBER: F19628-88-C-0025
MARK B FOLSOM

TITLE:

ELECTRONIC EQUIPMENT SHELTERS

TOPIC# 29 OFFICE: ESD/XR

IDENT#: 16537

THIS PHASE II PROJECT WILL CONTINUE MATERIALS RESEARCH AND REFINEMENT OF THE PHASE I DESIGN AND CONCEPT FOR CONSTRUCTING ELECTRONIC EQUIPMENT SHELTERS USING ADVANCED MATERIALS. THE MOST SIGNIFICANT BENEFIT OF THIS PHASE IS THAT IT WILL MOVE THE COMPOSITE SHELTER OFF THE DRAWING BOARD AND OUT OF THE LABORATORY ONTO THE MANUFACTURING FLOOR. USING PROPRIETARY TECHNOLOGY ADVANCES IN MANUFACTURING DEVELOPED BY ADVANCED COMPOSITE TECHNOLOGY, INC. (ACT) AND THE DESIGN DEVELOPED IN THIS PROJECT, SHELTER COMPONENTS WILL BE MANUFACTURED AND THEN TESTED. A SUB-SCALE SHELTER WILL BE MANUFACTURED AND DELIVERED TO THE AIR FORCE. ACT HAS DEVELOPED TWO TECHNOLOGIES SIGNIFICANT FOR THIS PROJECT. THE FIRST TECHNOLOGY IS TO LAY WET LAMINATE FIBERS AT COMMERCIAL SPEEDS AT PRECISE ANGLES PRODUCING A SMOOTH PRODUCT WITH MINIMAL VOIDS. THE SECOND TECHNOLOGY IS THE ABILITY TO FABRICATE COMPLEX GEOMETRIC SHAPES USING ROBOTICS.

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THE ABILITY TO MANUFACTURE AT COMMERCIAL SPEEDS USING NON PRE-PREG MATERIALS ALLOWS FOR TAILORING COMPOSITES EMPLOYING HYBRID FIBER MIXES AND OFFERS COMPARATIVELY MAJOR REDUCTIONS IN COSTS. THE SHELTERS WILL FEATURE A DESIGN THAT LENDS ITSELF TO MODULARITY WHICH CAN BE USED TO TAILOR A SHELTER CONFIGURATION TO SPECIFIC NEEDS PLUS PROVIDING INTEGRAL RFI SHIELDING AND BALLISTIC PROTECTION.

ADVANCED RESEARCH & APPLICATIONS CORP

425 LAKESIDE DR

SUNNYVALE, CA 94086

CONTRACT NUMBER: F33615-88-C-5511

RUSSELL E STACHOWSKI

TITLE:

SUPERVOLTAGE NDE TECHNIQUES FOR LARGE AEROSPACE STRUCTURES

TOPIC# 94 OFFICE: AFWAL/ML IDENT#: 16640

INNOVATIVE TECHNICAL APPROACHES FOR DETECTING AND CHARACTERIZING DEFECTS IN LARGE AEROSPACE STRUCTURES ARE URGENTLY NEEDED. THE INTEGRITY OF LARGE SOLID ROCKET BOOSTERS OR EMBEDDED SYSTEMS LIKE JET ENGINES ARE GOOD EXAMPLES OF CRITICAL APPLICATIONS. UNFORTUNATELY, IN FULLY ASSEMBLED COMPONENTS, THOSE ZONES WHICH ARE THE MOST CRITICAL TO SYSTEM RELIABILITY, ARE ALSO THE MOST IN-ACCESSIBLE TO STANDARD EXAMINATION TECHNIQUES. A COMPUTED TOMOGRAPHY (CT) SYSTEM WOULD IN THEORY BE ABLE TO PROVIDE AN INSPECTION CAPABILITY WHICH COULD ADDRESS THESE QA PROBLEMS, BUT THE SIZE AND OPACITY OF LARGE COMPONENTS PRECLUDE THE USE OF EVEN THE MOST ENERGETIC RADIATION SOURCES USED TO DATE. AN INNOVATIVE CT CONCEPT EMPLOYING BREMSSTRAHLUNG RADIATION WITH PEAK ENERGIES IN THE 25 TO 60 MeV RANGE IS PROPOSED. THE APPLICATION OF THESE ENERGIES TO CT COMPLETES THE LOGICAL EXTENSION OF CT TO HIGHER ENERGIES SINCE MATERIAL ATTENUATIONS BEGIN TO INCREASE RAPIDLY ABOVE THESE VALUES. PHASE I EFFORT HAS ALREADY VERIFIED THE TECHNICAL FEASIBILITY OF THE CONCEPT BY RESOLVING KEY QUESTIONS RELATION TO OPERATION AT ELEVATED ENERGIES. THE DESIGN AND CONSTRUCTION OF A PRE-PROTOTYPE SUPERVOLTAGE CT SYSTEM AND AN EXPERIMENTAL SERIES DESIGNED TO GENERATE THE FIRST IMAGE OF A FULL SIZE GOVERNMENT-FURNISHED TEST OBJECT IS PROPOSED. THIS IMAGE WILL SERVE AS EVIDENCE OF THE PRACTICALITY OF SUPERVOLTAGE NDE FOR LARGE AEROSPACE COMPONENTS.

AEREON CORP

TWENTY NASSAU ST

PRINCETON, NJ 08542

CONTRACT NUMBER: F19628-87-C-0145

MILLER/PUTMAN

TITLE:

PRELIMINARY DESIGN OF A WIDE AREA SURVEILLANCE PLATFORM

DYNAIRSHIP

TOPIC# 36 OFFICE: ESD/XR IDENT#: 16545

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PRELIMINARY DESIGN OF A WASP DYNAIRSHIP WILL PROCEED FROM THE BASELINE CONFIGURATION DEFINED IN PHASE I. POTENTIAL USERS WILL REQUIRE A REFINED AERODYNAMIC AND COMPOSITE STRUCTURAL DESIGN, A GENERAL ARRANGEMENT, MISSION PERFORMANCE SPECIFICATIONS AND FLIGHT SIMULATIONS, AND ACCURATE ECONOMIC ANALYSES. THOSE TASKS WILL BE PERFORMED WHICH WILL SUPPORT THE EVOLUTION OF A DOCUMENTED, PRELIMINARY DESIGN FOR THE ADVANCED, AEROBODY-TYPE PLATFORM. EXPERIMENTAL VALIDATION TASKS THEN WILL BE RECOMMENDED TO REDUCE RISK AND TO FORTIFY CONFIDENCE FOR THE PHASE III DEVELOPMENT PROGRAM. THREE QUARTERLY AND A FINAL REPORT WILL INFORM THE AFSC/ESD OF THE PRELIMINARY DESIGN AND ITS FUTURE POTENTIAL.

AERODYNE PRODUCTS CORP
76 TREBLE COVE RD
NORTH BILLERICA, MA 01862
CONTRACT NUMBER: F33615-88-C-3013
DR MORTON CAMAC

TITLE:

NO(2) CHEMILUMINESCENT IMAGING FOR LOW DENSITY FLOW VISUALIZATION
AND VELOCITY MEASUREMENT

TOPIC# 119 OFFICE: AFWAL/FI IDENT#: 16679

VISIBLE CHEMILUMINESCENT RADIATION FROM THE CHEMICAL REACTION OF NITRIC OXIDE, NO AND ATOMIC OXYGEN, O, CAN BE USED TO VISUALIZE LOW DENSITY (LESS THAN 0.1 ATMOSPHERE) FLOWS. NO IS INTRODUCED IN THE HIGH PRESSURE SECTION UPSTREAM OF THE NOZZLE. ATOMIC OXYGEN IS PRODUCED BY ULTRAVIOLET LIGHT PHOTODISSOCIATION OF O₂ IN THE AIR. 168 nm ULTRAVIOLET LIGHT IS PRODUCED BY AN EXCIMER LASER AND RAMAN CELL. ONLY THE REGION CONTAINING THE ATOMIC OXYGEN PRODUCES RADIATION AND THE ATOMIC OXYGEN IS CONVECTED DOWNSTREAM WITH THE FLOW. A TV CAMERA MEASURES THE VISIBLE CHEMILUMINESCENT RADIATION. THERE ARE THREE KINDS OF MEASUREMENTS: 1) MOTION OF RADIATING REGION, 2) RADIATION INTENSITY, AND 3) RADIATION LIFETIME. THESE CAN FURNISH THE FOLLOWING INFORMATION: AIR TEMPERATURE, PRESSURE, AND FLOW VELOCITY; SHOCK WAVE LOCATION AND SHOCK MACH NUMBER; AND BOUNDARY LAYER VELOCITY AND TEMPERATURE PROFILES. THIS CHEMILUMINESCENCE RADIATION IS IDEAL FOR DETERMINING FLOW PROPERTIES OF MIXING FLOWS, FOR EXAMPLE JETS INTO SUPERSONIC FLOWS. BY USING

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DIFFERENT COMBINATIONS OF NO AND O2 IN THE JET AND MAIN FLOW, ONE CAN OBSERVE THE MAIN FLOW INTERACTION SHOCK, THE MIXING REGION, AND THE JET FLOW BARREL AND MACH DISK SHOCKS.

AMERASIA TECHNOLOGY INC
620-1 HAMPSHIRE RD
WESTLAKE VILLAGE, CA 91361

CONTRACT NUMBER:

DR EDWARD J STAPLES

TITLE:

HIGH PERFORMANCE HRG RESONATOR MATERIALS

TOPIC# 202 OFFICE: BMO/MYSC IDENT#: 16746

THIS PROPOSAL ADDRESSES THE NEED FOR HIGH Q MATERIALS AND FABRICATION TECHNIQUES FOR HEMISPHERICAL RESONATOR GYROS (HGR). THE HGR OFFERS IMPROVED ROTATION SENSING WITH SIMPLIFIED SYSTEM MECHANIZATION, HIGHER RELIABILITY, AND IMPROVED LIFE CYCLE COST FOR INERTIAL NAVIGATION SYSTEMS FOR BALLISTIC MISSILES. PROTOTYPE HRGs HAVE DEMONSTRATED OVERALL DRIFT RATES OF 0.003 DEG/HR AND THE ABILITY TO OPERATE WITHOUT POWER IN A NUCLEAR ENVIRONMENT WITHOUT LOSS OF ACCURACY. IN PHASE I, THE PERFORMANCE OF PROTOTYPE HRGs BUILT BY DELCO ELECT. WERE EVALUATED IN TERMS OF AN ERRO-BUDGE MODEL. THE RESULTS SHOW THAT CURRENT PERFORMANCE IS LIMITED BY MATERIAL DAMPING AND FABRICATION TECHNIQUES. CURRENTLY HRGs ARE FABRICATED BY MACHINING A FLEXURAL MODE RESONATOR FROM A SOLID PIECE OF FUSED QUARTZ. THE PHASE I RESULTS INDICATE NEW HIGH Q MATERIALS FOR LOW-FREQUENCY FLEXURAL MODE RESONATORS OF THIS TYPE MAY SIGNIFICANTLY IMPROVE THE CURRENT HRG PERFORMANCE. HENCE, A PHASE II EVALUATION OF HIGH Q MATERIALS AND FABRICATION TECHNOLOGY FOR HRGs IS PROPOSED. WITH HIGHER Q MATERIALS AND LESS STRESSFUL FORMING, AN ORDER OF MAGNITUDE IMPROVEMENT IN HRG PERFORMANCE IS PREDICTED.

AMERICAN SCIENCE & ENGINEERING INC
FORT WASHINGTON
CAMBRIDGE, MA 02139

CONTRACT NUMBER: F19628-87-C-0124

DR FREDRICK SEQUIN

TITLE:

HIGH-RESOLUTION DIGITAL X-RAY INSPECTION OF SURFACE-MOUNT
SOLDER JOINTS ON PRINTED CIRCUIT BOARDS

TOPIC# 28 OFFICE: ESD/XR IDENT#: 16536

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A HIGH-RESOLUTION, DIGITAL X-RAY IMAGING SYSTEM HAS BEEN DEMONSTRATED DURING PHASE I TO PROVIDE EXTREMELY HIGH QUALITY IMAGES OF SURFACE-MOUNT PRINTED CIRCUIT BOARDS. DEFECTS IN SOLDER JOINTS COULD IN MANY CASES BE EASILY IDENTIFIED THROUGH VISUAL IMAGE INSPECTION, AND COULD ALSO BE IDENTIFIED AND CHARACTERIZED THROUGH QUANTITATIVE IMAGE ANALYSIS. WE PROPOSE IN PHASE II TO OPTIMIZE THIS POWERFUL X-RAY IMAGING SYSTEM DESIGN AND DEVELOP IMAGE ANALYSIS ALGORITHMS FOR AUTOMATIC IDENTIFICATION AND CHARACTERIZATION OF SOLDER JOINT DEFECTS. WE WILL EVALUATE THE POSSIBILITIES FOR USING A SIMILAR SYSTEM AS AN IMPORTANT PART OF A NEAR-REAL-TIME FEEDBACK LOOP IN AN INTEGRATED QUALITY ASSURANCE SYSTEM IN PRODUCTION-LINE SITUATIONS. THIS APPROACH OFFERS IMPORTANT ADVANTAGES OVER OTHER INSPECTION MODES. SURFACE-MOUNT METHODS MAKE MANY JOINTS INACCESSIBLE FOR VISIBLE-LIGHT INSPECTION, AND OTHER X-RAY IMAGING METHODS ARE EITHER MUCH SLOWER (FILM), OR HAVE MUCH POORER SPATIAL AND CONTRAST RESOLUTION (FLUOROSCOPY). OUR PATENTED DETECTION SYSTEM PROVIDES NEAR-REAL-TIME DATA WITH HIGH DYNAMIC RANGE (12 BITS) AND SENSITIVITY TO DEFECTS AS SMALL AS 0.001 INCHES IN SIZE.

AMHERST SYSTEMS INC

30 WILSON RD

BUFFALO, NY 14221

CONTRACT NUMBER: 30602-88-C-0139

CESAR BANDERA

TITLE:

PARALLEL PROCESSING ARCHITECTURE - APPLICATION CORRELATION

TOPIC# 50 OFFICE: RADC/XPX IDENT#: 16213

THE SOFTWARE LIFECYCLE FOR PARALLEL COMPUTERS IS QUITE SIMILAR TO THAT OF CONVENTIONAL SERIAL OR UNIPROCESSOR SYSTEMS, DIFFERING PRIMARILY IN NEW SOFTWARE DEVELOPMENT ISSUES WHICH HAVE ARISEN WITH THE ADVENT OF PARALLEL COMPUTING. DEVELOPMENT TIME, SYSTEM PERFORMANCE, AND MAINTENANCE REQUIREMENTS ARE DETERMINED IN GREAT PART BY HOW WELL THE SOFTWARE APPROACH MATCHES A PARALLEL HARDWARE ARCHITECTURE. THE WIDE SPECTRUM OF PARALLEL ARCHITECTURAL MODES AND THE LACK OF COMPREHENSIVE SOFTWARE DEVELOPMENT TOOLS FOR PARALLEL MACHINES MAKES THE TASK OF CHOOSING A SUITABLE PARALLEL ARCHITECTURE VERY DIFFICULT TO PERFORM AND IMPOSES ON THE TASK OF DISPRO-

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PORTIONATELY GREATER AMOUNT OF THE RISK OF THE OVERALL PARALLEL SOFTWARE LIFECYCLE. THIS PROJECT WILL EXTEND THE PHASE I STUDY OF THE CURRENT STATE OF PARALLEL SOFTWARE ENGINEERING AND DEVELOP A DOCUMENT WHICH WILL GUIDE THE SOFTWARE ENGINEER THROUGH THE PARALLEL SOFTWARE LIFECYCLE, AS WELL AS DIRECT THE ENGINEER TO A SUITABLE PARALLEL ARCHITECTURE GIVEN A PARTICULAR APPLICATION. BY COMMENCING AT THE APPLICATION DEFINITION STAGE, THE GREATER PART OF THE LIFECYCLE IS ADDRESSED. THIS PROJECT WILL ALSO IMPLEMENT THE KNOWLEDGE BASE OF THE DOCUMENT ON AN AUTOMATED DATABASE. THE DATABASE WILL BE INTERACTIVE AND WILL ERGONOMICALLY ASSIST THE SOFTWARE ENGINEER IN HIS/HER APPLICATION. THE DATABASE WILL ALSO BE EASILY EXPANDABLE SO AS TO INCORPORATE NEW TECHNOLOGIES AND APPLICATION RESULTS.

ANALYSIS & COMPUTER SYSTEMS INC

209 BURLINGTON RD

BEDFORD, MA 01730

CONTRACT NUMBER:

CARLETON F BRYANT III

TITLE:

ANALYSIS/DEMONSTRATION OF ADVANCED AIR TRAFFIC CONTROL CONCEPTS

TOPIC# 32

OFFICE: ESD/XR

IDENT#: 20296

THIS IS A PROPOSED EXTENSION OF STUDIES CONDUCTED UNDER A PHASE I EFFORT TO REFINE AN EXISTING TACTICAL WARFARE ATC CONCEPT, THE AUTOMATIC LAUNCH AND RECOVERY SYSTEM (ATALARS). THAT INITIAL EFFORT INVOLVED THE SPECIFICATION FOR A ATALARS CONCEPT DEMONSTRATION TO BE CONDUCTED AS A MAJOR TASK OF PHASE II. SPECIFICALLY, PHASE II WILL CONCENTRATE ON THE PROOF OF CONCEPT OF THE GROUND CONTROL UNIT PORTION OF ATALARS WITH PARTICULAR EMPHASIS UPON ITS JOINT TACTICAL INFORMATION DATA SYSTEM (JTIDS) COMMUNICATION CAPABILITIES. THE ENVIRONMENT FOR THE DEMONSTRATION WILL BE ACSI'S ENHANCED JTIDS SYSTEM EXERCISER (EJSE). THIS DEMONSTRATION WILL INVOLVE EJSE MODIFICATIONS TO PROVIDE THE CAPABILITIES FOR INTERACTIVE SIMULATION, AUTOMATIC MESSAGE GENERATION, REAL-TIME DATABASE MAINTENANCE, AND THE TRANSLATION OF ADVANCED ATC ALGORITHMS, AND MAKES INTO COMPUTER SOFTWARE. THESE CAPABILITIES WILL BE DEVELOPED INCREMENTALLY AND DEMONSTRATED AS THEY EVOLVE. WHEN THEY ARE FULLY ACHIEVED, THE EJSE WILL BECOME A PRECURSOR FOR THE ATALARS GCU AND SERVE AS A TEST BED

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FOR ITS FURTHER DEVELOPMENT.

ANALYTICS INC
2500 MARYLAND RD
WILLOW GROVE, PA 19090
CONTRACT NUMBER:
PAUL R SAUNDERS
TITLE:
DIAGNOSTIC RULES GENERATOR
TOPIC# 88 OFFICE: AMD/RDO IDENT#: 20054

THE APPLICATION OF EXPERT SYSTEMS TECHNOLOGY TO THE INTERPRETATION OF TELEMETRY DATA, SUCH AS MEDICAL IMAGERY AND SENSOR DATA, OFFERS SUBSTANTIAL PAYOFFS. LESS EXPERIENCED PHYSICIANS WOULD BE ABLE TO PERFORM AS WELL AS EXPERTS; EXPERTISE WOULD BE CONSERVED WHEN AN EXPERT DEPARTS; AND DIAGNOSES WOULD BE MADE CONSISTENT AND REPRODUCIBLE. BUT THE KNOWLEDGE UNDERLYING EXPERT TELEMETRY INTERPRETATION IS COMPLEX, INVOLVING VISION AND PATTERN RECOGNITION AS WELL AS RULES. THE PROPOSED EFFORT COVERS THE DEVELOPMENT OF A WORKSTATION WHICH WILL USE ADVANCED PATTERN RECOGNITION HARDWARE AND SOFTWARE TOGETHER WITH MACHINE LEARNING TO LEARN AND APPLY A PHYSICIAN'S DIAGNOSTIC CRITERIA FOR MEDICAL TELEMETRY. FEASIBILITY WAS DEMONSTRATED UNDER A PRIOR PHASE I EFFORT. THE WORKSTATION WILL DEVELOP RULE BASES FOR PARTICULAR DIAGNOSTIC PROBLEMS. A DIAGNOSTICIAN CAN SELECT AND RUN A RULE BASE TO OBTAIN ADVICE AND ASSISTANCE IN THE DIAGNOSIS OF A CASE. THE FIRST APPLICATION WILL BE THE DIAGNOSIS OF PLANAR THALLIUM MYOCARDIAL IMAGERY. AT THE END OF THE EFFORT, THE WORKSTATION WILL BE INSTALLED AT THE SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB.

ANTROPIX CORP
301 MEADOWFAIR CT
THE WOODLANDS, TX 77381
CONTRACT NUMBER: F29601-87-C-0040
DR MICHAEL BERRY
TITLE:
TIME RESOLVED TARGET AND PLUME OPTICAL PROPERTIES MEASUREMENTS DURING RP LASER INTERACTIONS
TOPIC# 197 OFFICE: AFWL/PRC IDENT#: 20359

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*ANTROPIX CORPORATION PROPOSES TO OBTAIN TIME RESOLVED TARGET AND PLUME OPTICAL PROPERTIES MEASUREMENTS DURING RP LASER INTERACTIONS. TARGET ABSORBANCES (BOTH SURFACE AND IN-DEPTH) AND REFLECTANCES WILL BE DETERMINED WITH INTEGRATING SPHERE DEVICES PLUS PROBE BEAMS AND FAST DETECTORS. PLUME OPTICAL PROPERTIES DUE TO ATOMIC, MOLECULAR, PARTICULATE, AND PLASMA SPECIES WILL BE DETERMINED USING LASER PROBE ATTENUATION BEAMS AND FAST MULTICHANNEL DETECTORS. OPTICAL PROPERTIES OF BOTH BASELINE AND HARDENED MATERIALS WILL BE EXAMINED DURING IRRADIATION WITH RP HF/DF CHEMICAL LASER SYSTEMS (AT 2.7 AND 3.8 MICRONS, RESPECTIVELY) AND RP EXCIMER LASER SYSTEMS (AT 249 NM, 351 NM, ETC.). TARGET OPTICAL MEASUREMENTS WILL BE ANALYSED TO OBTAIN ABSORPTION AND SCATTERING COEFFICIENTS FOR TRANSMISSION OF LASER RADIATION THROUGH MATERIALS AND TO OBTAIN SPECULAR AND DIFFUSE REFLECTION COEFFICIENTS FOR DECOUPLING OF LASER RADIATION FROM THE TARGET SURFACE. SIMULTANEOUS PLUME ATTENUATION MEASUREMENTS WILL BE USED TO ESTABLISH THE ABUNDANCES, ENERGY CONTENTS, AND OPTICAL PROPERTIES OF VAPOR, PLASMA, AND DEBRIS SPECIES WITH TEMPORAL, SPATIAL, AND SPECTRAL RESOLUTION. THE EFFECTS OF LASER AND INTERACTION PARAMETERS UPON TARGET RESPONSES AND PLUME STRUCTURE AND PROPERTIES (INCLUDING BEAM/PLUME COUPLING AND/OR BLOCKAGE) WILL BE DETERMINED. ALL OF THIS INFORMATION WILL BE RELATED TO MECHANISTIC MODELS OF LASERS/MATERIALS INTERACTIONS, WITH PARTICULAR EMPHASIS ON LETHALITY AND TARGET HARDENING ISSUES.

AOG SYSTEMS CORP
PO BOX M
HARVARD, MA 01451
CONTRACT NUMBER: 30602-88-C-0114
DR HENRY C LEFKOVITS
TITLE:
DEVELOPMENT OF A PROTOTYPE LOCAL AREA NETWORK SCHEMA SERVER
TOPIC# 62 OFFICE: RADC/XPX IDENT#: 16222

THIS PROPOSAL ADDRESSES THE DEVELOPMENT OF A PROTOTYPE LOCAL AREA NETWORK SCHEMA SERVER (LANSS) WHICH ENABLES THE PROCESSING OF USER QUERIES AGAINST MULTIPLE DATABASES RESIDING IN THE LAN. HETEROGENEOUS DBMSs RESIDING ON DIFFERENT KINDS OF COMPUTERS ARE TO BE SUPPORTED, AND ADMINISTRATOR COMMANDS WILL BE PROVIDED THAT ALLOW

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THE NETWORK SCHEMA AND NETWORK VIEWS TO BE MAINTAINED. DBMSs SUPPORTED IN THE PROTOTYPE WILL BE THE RELATIONAL DBMSs INGRES AND ORACLE, AND DBMS, A CODASYL SYSTEM. ADDITIONALLY, THE USER WILL BE ALLOWED TO ACCESS A TEXT DATABASE USING KEYWORDS THAT HAVE BEEN ASSIGNED TO THE TEXT. THE QUERIES WILL BE DECOMPOSED INTO SUBQUERIES BASED ON META-DATA RESIDING IN AN INFORMATION RESOURCE DICTIONARY SYSTEM (IRDS), THESE SUBQUERIES ARE DISPATCHED TO THE RESIDENT DBMSs WHICH CONTAIN APPLICABLE DATA, AND THE SUBQUERY RESPONSES ARE AGGREGATED INTO A COMPOSITE QUERY RESPONSE WHICH IS RETURNED TO THE USER. THE PROTOTYPE WILL PROVIDE A NATURAL LANGUAGE INTERFACE FOR THE USER. THE WORK DONE IN PHASE I WAS BASED ON PREVIOUS WORK DONE BY AOG SYSTEMS CORPORATION FOR ROME AIR DEVELOPMENT CENTER ON THE DESIGN OF DATABASE UTILITIES AND THE SPECIFICATION OF THE STANDARD IRDS.

APA OPTICS INC
2950 NE - 84TH LN
BLAINE, MN 55432
CONTRACT NUMBER: F33615-89-C-1001
ANIL K JAIN
TITLE:
INTEGRATED OPTICS SCANNER FOR WAFER INTERCONNECT
TOPIC# 154 OFFICE: AFWAL/AA IDENT#: 16724

THE OVERALL OBJECTIVE OF PHASE II IS TO DEMONSTRATE THE APPLICATIONS OF INTEGRATED OPTICAL SCANNER ... AND NEW COMPUTING ARCHITECTURES ARE BEING DEVELOPED TO MEET THE GROWING DEMAND FOR INCREASED THROUGHPUT OF HIGH SPEED PROCESSORS. ELECTRICAL INTERCONNECTS AND SWITCHING HAVE BEEN IDENTIFIED AS BOTTLENECKS TO THESE DEVELOPMENTS. REAL TIME CONTROLLABLE AND ADDRESSABLE OPTICAL INTERCONNECT TECHNOLOGIES HAVE SHOWN THE POTENTIAL TO ALLEVIATE THESE PROBLEMS. DURING PHASE I WE INVESTIGATED THE FEASIBILITY OF UTILIZING IQS A REAL-TIME CONTROLLABLE LASER SCANNER WITHOUT ANY MOVING PARTS -- FOR WAFER INTERCONNECT, WITH PROMISING RESULTS. OUR ANALYSIS SHOWS THAT THE IQS WILL HAVE SUBSTANTIAL APPLICATIONS IN TRANSMITTING THE DATA FROM THE FOCAL PLANE TO THE PROCESSOR AND IN PROVIDING REAL-TIME PROCESSOR/CONTROLLER INTERFACE, WITH HIGH THROUGHPUT AND WITHOUT ANY WIRE CONNECTIONS. WE PLAN TO ANALYZE VARIOUS IR FOCAL PLANE/PROCESSOR INTERFACE APPLICATIONS USING THE IQS, AND COMPARE WITH

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OTHER APPROACHES. SUBSEQUENTLY, WE PLAN TO DEVELOP A SPECIFIC ARCHITECTURE FOR GEOMETRIC ARITHMETIC PARALLEL PROCESSOR. WE WILL DEMONSTRATE SEVERAL KEY ISSUES, INCLUDING PIXEL ADDRESSABILITY, THROUGHPUT, AND PIXEL ACCESS TIME, USING VARIOUS DEMONSTRATION MODELS.

APPLIED RESEARCH ASSOCS INC
7114 W JEFFERSON AVE - STE 305
LAKEWOOD, CO 80235
CONTRACT NUMBER:
PETER T DZWILEWSKI
TITLE:
MISSILE TRANSPORTER-ERECTOR-LAUNCHER (TEL) MOBILITY
TOPIC# 203 OFFICE: BMO/MYSC IDENT#: 16747

A METHOD TO PREDICT THE OFF-ROAD PERFORMANCE OF A HEAVY WHEELED MISSILE TRANSPORTER-ERECTOR-LAUNCHER (TEL) WILL BE DEVELOPED. THIS METHOD, WHICH CAN BE USED BY THOSE WHO NEED TO EVALUATE THE MOBILITY OF FOREIGN TELs, WILL DEFINE THE TIRE SINKAGE, MOBILITY RESISTANCE, RANGE, SPEED, AND EXCLUSION AREAS. THE STEPS FOR DEVELOPING THIS METHOD ARE: (1) DEVELOP ENGINEERING MODELS FOR SOVIET SOILS, (2) EXTEND THE FIRST PRINCIPLE CALCULATIONAL METHODOLOGY, (3) STUDY THE DIFFERENCE BETWEEN THE TEL AND CONVENTIONAL VEHICLE MOBILITY DATA, (4) DEVELOP ROBUST MOBILITY RELATIONSHIPS, (5) PERFORM CONTROLLED FIELD TESTS WITH TEL SIMULATOR, AND (6) DEVELOP A MOBILITY EXPERT SYSTEM THAT INCORPORATES THE RESULTS OF THIS RESEARCH.

APTEK INC
1257 LAKE PLAZA DR
COLORADO SPRINGS, CO 80906
CONTRACT NUMBER: F29601-87-C-0020
BRETT A LEWIS
TITLE:
INTELLIGENT SATELLITE SURVIVABILITY
TOPIC# 194 OFFICE: AFWL/PRC IDENT#: 16608

CURRENT SATELLITE SURVIVABILITY ASSESSMENTS ARE A TIME CONSUMING AND

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COMPLEX PROCEDURE. BY SUCCESSFULLY REDUCING THIS COMPLEXITY THE PHASE I DEMONSTRATION SYSTEM PROVED THE FEASIBILITY OF USING ARTIFICIAL INTELLIGENCE TECHNIQUES FOR SATELLITE ASSESSMENTS. THE GOAL OF THIS PHASE II PROPOSAL IS TO DEVELOP AND DELIVER AN INTELLIGENT SATELLITE SURVIVABILITY ASSISTANT (ISSA) TO HELP THE USER MAKE SATELLITE ASSESSMENTS QUICKLY AND ACCURATELY. THE SYSTEM WILL INCLUDE ALL PHASES OF SATELLITE ASSESSMENT, FROM SOLID MODELING, TO DOSE CALCULATION, TO GRAPHICAL DISPLAY OF THE ANALYSIS RESULTS. THE COMBINATION MENU AND NATURAL LANGUAGE COMMAND LINE INTERFACE OFFER SUPPORT FOR BOTH NOVICE AND EXPERT USERS. THE ISSA WILL BE EQUIPPED WITH A KNOWLEDGE BASE EDITOR AND VIEWER WHICH WILL BE VERY IMPORTANT IN PHASE II DUE TO THE INCREASED INTENSITY OF THE KNOWLEDGE. AN IMPORTANT PART OF THE PHASE II ISSA WILL BE THE CAPABILITY OF IMPROVING ITSELF (LEARN) BASED ON PREVIOUS EXPERIENCE. AREAS OF LEARNING INCLUDE THE CALCULATION OF A REGION DENSITY AND SELF-CUSTOMIZATION TO A SPECIFIC USER. THE RESULTING ISSA WILL BE DESIGNED TO RUN ON BOTH VMS AND UNIX. WITH THE ABOVE FEATURES A SOPHISTICATED SYSTEM CAN BE DELIVERED THAT PROVIDES MORE ACCURATE AND LESS EXPENSIVE SURVIVABILITY PREDICTIONS.

ARNCO

4071 S ACCESS RD

CHATTANOOGA, TN 37406

CONTRACT NUMBER: F33615-88-C-3411

RICHARD W YOUNG

TITLE:

SELF SEALING/LOW VULNERABILITY AIRCRAFT TIRE

TOPIC# 114 OFFICE: AFWAL/FI IDENT#: 16673

THE PRACTICALITY AND ABILITY TO PROTECT AN AIRCRAFT TIRE FROM BALLISTIC PENETRATIONS UP TO 7.62 mm HAS BEEN DEMONSTRATED. USING SEMI-AUTOMATED TECHNIQUES A NOMINAL 0.250 INCH SELF-SEALING POLYURETHANE LINING WAS PLACED OVER THE ENTIRE INNER SURFACE OF A F-16 AIRCRAFT TIRE. THE COATING WAS HOMOGENOUS THROUGHOUT AND DISPLAYED NO NEGATIVE EFFECTS UPON THE DYNAMIC PROPERTIES OF THE TIRE SYSTEM. THE LINED TIRES WERE SUBJECTED TO TEST FIRINGS USING STANDARD NATO 7.62 mm PROJECTILES. IN ALL CASES THE TIRES SEALED SUCCESSFULLY. THE POLYURETHANE WAS ALSO EVALUATED IN EXTREME ENVIRONMENTS OF HEAT AND COLD WITH POSITIVE RESULTS. IT REMAINS TO

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UPGRADE AND AUTOMATE THE LINING SYSTEM WITH THE NECESSARY EQUIPMENT, CONTROLS AND TECHNIQUES TO PROVIDE AN ACCESSABLE FACILITY FOR PROCUREMENT OF SELF-SEALING TIRES BY THE AIR FORCE AND OTHER ELEMENTS OF THE U.S. GOVERNMENT. ADDITIONAL STATIC AND DYNAMIC TESTING MUST BE CONDUCTED TO PREPARE A PURCHASE SPECIFICATION FOR THE PROCUREMENT OF LINED TIRES. THE SYSTEM WILL BE INEXPENSIVE IN USE AND OPERATIONALLY SIMPLE.

ASTRON CORP
929 W BROAD ST - STE 249
FALLS CHURCH, VA 22046
CONTRACT NUMBER:
JOSEPH R JAHODA
TITLE:
BROADBAND HF/VHF ANTENNA SYSTEM
TOPIC# 36 OFFICE: ESD/XR IDENT#: 16521

TO ACHIEVE THE PROGRAM GOALS OF ULTIMATELY FABRICATING AND DEMONSTRATING MINIATURIZED BROADBAND, HF/VHF ANTENNAS FOR USE ON AIR FORCE VEHICLES, THE TWO CRITICAL TECHNICAL ASPECTS OF THE PROBLEM, FORESHORTENING AND BROADBANDING, HAVE BEEN STUDIED, PROTOTYPE CONCEPTS DEVELOPED, AND ENGINEERING FEASIBILITY ASSESSED IN AN EXTENSIVE PHASE I PROGRAM UNDERTAKEN BY ASTRON. REALIZATION OF THESE CONCEPTS REQUIRED ADDITIONAL COMPUTER MODELLING AND LABORATORY AND ANTENNA RANGE TESTING WELL SUITED TO A PHASE II EFFORT GOALS AND PURPOSE. THE CULMINATION OF THE PHASE II EFFORT WILL BE THE DELIVERY OF SEVERAL ENGINEERING MODEL ANTENNAS FOR EVALUATION OF ACTUAL AIR FORCE PLATFORMS.

ATSS INC
606 E MILL ST - STE 1022
SAN BERNARDINO, CA 92408
CONTRACT NUMBER:
LIAM S GROENER
TITLE:
INTEGRALLY COOLED ANTENNA PROGRAM
TOPIC# 237 OFFICE: BMO/MYSC IDENT#: 16786

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ADVANCED SENSOR SYSTEMS REQUIRE THERMAL PROTECTION TO SURVIVE ICBM REENTRY ENVIRONMENTS. TRADITIONAL PASSIVE THERMAL PROTECTION SOLUTIONS, SUCH AS THE USE OF ANTENNA WINDOWS, HAVE BEEN SHOWN ANALYTICALLY TO BE UNABLE TO PROVIDE ADEQUATE THERMAL PROTECTION WITHOUT SEVERELY DEGRADING SENSOR PERFORMANCE FOR SENSORS OPERATING AT HIGH FREQUENCIES. A CONCEPT HAS BEEN IDENTIFIED WHICH ALLOWS THE SENSOR ARRAY ITSELF TO BE ACTIVELY COOLED, ELIMINATING THE NEED FOR AN ANTENNA WINDOW. THE COOLING SYSTEM APPEARS TO HAVE A NEGLIGIBLE EFFECT ON SENSOR PERFORMANCE. IN THE PROPOSED EFFORT, THE CONCEPT WILL BE DEVELOPED AND ANALYTICALLY AND EXPERIMENTALLY VERIFIED. RF, WIND TUNNEL AND ARCJET TESTS WILL BE USED TO UPDATE THE DESIGN AND ASSESS THE PERFORMANCE POTENTIAL OF THE COOLED ARRAY CONCEPT.

ATSS INC
606 E MILL ST - STE 1022
SAN BERNARDINO, CA 92408
CONTRACT NUMBER:
HENRY L MOODY
TITLE:
THREE-DIMENSIONAL ANTENNA WINDOW ABLATION
TOPIC# 240 OFFICE: BMO/MYSC IDENT#: 16790

THE PHASE II PROGRAM INVOLVES THE DEVELOPMENT OF A TRANSIENT, THREE-DIMENSIONAL ANTENNA WINDOW THERMAL/ABLATION ANALYSIS METHOD TO AID IN THE DESIGN AND EVALUATION OF STRATEGIC REENTRY MICROWAVE SUBSYSTEMS. THE ANALYSIS METHOD WILL CONSIDER THE SHAPE CHANGE AND THERMAL RESPONSE OF THE ANTENNA WINDOW AND ADJACENT HEATSHIELD FOR BOTH BALLISTIC AND MANEUVERING REENTRY SYSTEMS. MATERIAL CANDIDATES ARE BOTH SUBLIMING AND MELTING ABLATORS AND THE EFFECTS OF LARGE ANGLE OF ATTACK SHALL BE INCLUDED IN THE ANALYSIS METHOD. THE CODE SHALL BE APPLIED TO GROUND AND FLIGHT TEST RESULTS TO VERIFY CODE CAPABILITIES.

BARRON ASSOCS INC
RTE 1 - BOX 159
STANARDSVILLE, VA 22973
CONTRACT NUMBER: F33615-88-C-3615
GERARD J MONTGOMERY
TITLE:
ABDUCTIVE AND INDUCTIVE REASONING IN MAINTENANCE DIAGNOSTIC SYSTEMS
TOPIC# 123 OFFICE: AFWAL/FI IDENT#: 16683

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THE PROPOSED RESEARCH IS FOR DEVELOPMENT OF ABDUCTIVE AND INDUCTIVE REASONING ALGORITHMS THAT WILL AID IN THE DEVELOPMENT OF FLIGHT CONTROL SYSTEM (FCS) MAINTENANCE DIAGNOSTIC SYSTEMS AND THAT WILL OVERCOME MANY OF THE LIMITATIONS OF EXISTING DIAGNOSTIC TECHNOLOGY. A FOCUS OF THE EFFORT WILL BE THE DEVELOPMENT OF A CAPABILITY TO REASON ABOUT FCS FAULTS AT A SYSTEM LEVEL WITH UNCERTAIN INFORMATION. THE OBJECTIVES OF THE EFFORT ARE TO: EXPAND THE THEORETICAL FOUNDATION FOR ABDUCTIVE AND INDUCTIVE REASONING AS APPLIED TO COMPLEX PROBLEMS AND IN RELATIONSHIP TO HUMAN REASONING; TO DESIGN, DEVELOP, IMPLEMENT, AND TEST A GENERIC PROTOTYPE DAIR SYSTEM CAPABLE OF REASONING ABDUCTIVE AND INDUCTIVELY IN A MANNER SIMILAR TO HUMANS THAT WILL PROVIDE DIAGNOSTIC CAPABILITIES SUPERIOR TO THOSE AVAILABLE USING CURRENT TECHNOLOGY; PROVIDE CONCLUSIVE APPLICATION DEMONSTRATIONS ILLUSTRATING THE CAPABILITY TO REASON ABOUT FLIGHT CONTROL SYSTEM FAILURES AT A SYSTEM LEVEL WITH UNCERTAIN INFORMATION IN REAL-TIME; AND, TO DEFINE THE PHASE III DAIR SYSTEM AND FUTURE RESEARCH REQUIREMENTS. THESE OBJECTIVES WILL BE MET BY DEVELOPING A PROTOTYPE FCS DIAGNOSTIC ABDUCTIVE AND INDUCTIVE REASONING (DAIR) SYSTEM CONTAINING ALL THE REQUIRED FUNCTIONALITY OF THE FINAL SYSTEM AND PROVIDING PERFORMANCE SUPERIOR TO THAT OBTAINABLE USING ANY OTHER EXISTING SYSTEM.

BIO-TECHNICAL RESOURCES INC
1035 S 7TH ST
MANITOWOC, WI 54220
CONTRACT NUMBER: F33615-89-C-5601
PAUL E SWANSON
TITLE:
DEVELOPMENT PROGRAM FOR THE MICROBIAL CONVERSION OF
PHENYLACETYLENE TO META-HYDROXY PHENYLACETYLENE
TOPIC# 101 OFFICE: AFWAL/ML IDENT#: 16649

TECHNICAL AND ECONOMIC FEASIBILITY FOR A MICROBIAL CONVERSION OF PHENYLACETYLENE TO META-HYDROXY PHENYLACETYLENE WAS CLEARLY DEMONSTRATED IN THE PHASE I PROGRAM. THE ECONOMIC ANALYSIS WAS USED TO ESTABLISH THE OVERALL TECHNICAL OBJECTIVES. THE TECHNICAL OBJECTIVES FOR THE PHASE II PROGRAM ARE TO IDENTIFY THE BEST ORGANISM FOR THE BIOCONVERSION AND TO BEGIN DEVELOPMENT OF THE ORGANISM AND

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THE FERMENTATION PROCESS. THE ORGANISM AND PROCESS WILL BE DEVELOPED TO ACHIEVE THE FOLLOWING CHARACTERISTICS: 1) HIGH MOLAR YIELD OF META-HYDROXY PHENYLACETYLENE FROM PHENYLACETYLENE; 2) HIGH SPECIFICITY MONOHYDROXYLATION AT THE MET POSITION; 3) SIGNIFICANT ACCUMULATION OF META-HYDROXY PHENYLACETYLENE IN FERMENTATION BROTH AND 4) INABILITY TO COMPLETELY METABOLIZE PHENYLACETYLENE. THE PROGRAM WILL BEGIN WITH MICROBIAL SCREENING OF ENVIRONMENTAL SAMPLES TO FIND THE BEST ORGANISM FOR THE BIOCONVERSION AND THE DEVELOPMENT OF NEW ANALYTICAL METHODS. THE PROCESS WILL BE DEVELOPED BY STRAIN IMPROVEMENT METHODS TO GENETICALLY MANIPULATE THE MICROORGANISM PROCESS WILL BE SCALED UP TO ALLOW RECOVERY OF GRAM QUANTITIES OF META-HYDROXY PHENYLACETYLENE. RECOMBINANT DNA TECHNOLOGY WILL NOT BE USED IN THIS PROGRAM.

BIOMAGNETIC TECHNOLOGIES INC
4174 SORRENTO VALLEY BLVD
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR STEPHEN E ROBINSON
TITLE:
MAGNETOENCEPHALOGRAPHY BY LEAD FIELD SYNTHESIS
TOPIC# 78 OFFICE: AMD/RDO IDENT#: 20056

MAGNETOENCEPHALOGRAPHY (MEG) HAS BEEN USED IN THE STUDY OF HUMAN COGNITIVE PROCESSING AND MEASUREMENT OF TASK-RELATED BRAIN ACTIVITY. THE VALUE OF MEG TO SUCH STUDIES LIES IN ITS ABILITY TO LOCALIZE SOURCES OF ACTIVITY WITHIN THE BRAIN. IN PRACTICE, HOWEVER, THE UNRELATED SPONTANEOUS BRAIN ACTIVITY, OR BRAIN NOISE, MASKS THE DESIRED RESPONSE SO THE MEASUREMENT IS REPEATED MANY TIMES AND THE RESPONSES AVERAGED TO ACHIEVE AN ACCEPTABLE SIGNAL-TO-NOISE RATIO. REPETITION IS OFTEN IMPRACTICAL BECAUSE OF SUBJECT FATIGUE OR MODULATION OF ATTENTION. THE PROBLEM ADDRESSED BY THIS PROJECT IS TO DEVISE SIGNAL PROCESSING TECHNIQUES TO REDUCE THE INTERFERENCE OF BRAIN NOISE SO THE BRAIN'S RESPONSE CAN BE ASSESSED FROM ONE OR FEW TRIALS. OUR APPROACH TO THIS PROBLEM, LEAD FIELD SYNTHESIS (LFS), EXPLOITS THE SPATIAL REDUNDANCY AFFORDED BY MULTIPLE-SENSOR MEG MEASUREMENTS. LFS TRANSFORMS THE SIMULTANEOUS SIGNALS FROM ALL SENSORS INTO A SINGLE VIRTUAL SENSOR SIGNAL HAVING SPATIALLY SELECTIVE PROPERTIES. IN EFFECT, LFS FOCUSES THE SENSOR'S RESPONSE

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TO THE REGION OF INTEREST, AND ATTENUATES THE BRAIN NOISE DUE TO SOURCES ELSEWHERE IN THE BRAIN. THE FEASIBILITY OF THIS TECHNIQUE WAS DEMONSTRATED DURING PHASE I. DURING PHASE II WE WILL DEVELOP THIS LFS TECHNIQUE AND TEST ITS CAPABILITIES.

BRIMROSE CORP OF AMERICA
7720 BELAIR RD
BALTIMORE, MD 21236
CONTRACT NUMBER: F33657-89-C-2091
DR RONALD G ROSEMEIER
TITLE:

ADVANCED DEVELOPMENT OF FIBER-OPTIC IN-LINE MODULATOR FOR
GYROSCOPE APPLICATIONS
TOPIC# 158 OFFICE: ASD/AE IDENT#: 16731

BRIMROSE IN PHASE II WILL FURTHER DESIGN AND FABRICATE A NOVEL IN-LINE FIBER-OPTIC FREQUENCY SHIFTER WITH POTENTIAL APPLICATIONS IN LOW COST, HIGH PERFORMANCE GYROSCOPES OR ANY OTHER FIBER-OPTIC INTERFEROMETRIC SYSTEM. BRIMROSE IN WILL CONTINUE THE FURTHER DEVELOPMENT, DESIGN AND CONSTRUCTION OF HIGHER PERFORMANCE, HIGHER FREQUENCY FIBER OPTIC IN-LINE MODULATOR DEVICES. ISSUES THAT WILL BE INVESTIGATED WILL BE HIGHER FREQUENCY OF OPERATION IN THE RANGE OF 1 GHz AND HIGHER DIFFRACTION EFFICIENCIES. ALSO, SPIN-OFFS OF THIS TECHNOLOGY WILL THE EMPHASIS UPON AIR FORCE FIBER-OPTIC APPLICATIONS WILL BE EXPLORED. THE PHASE II CORE PROGRAM WILL ADDRESS TWO TYPES OF DEVICES THAT WILL BE DESIGNED AND BUILT: A) A HIGH EFFICIENCY MODULATOR WITH THE TRANSDUCER BONDED DIRECTLY INTO THE FIBER, AND B) A HIGH FREQUENCY MODULATOR WITH AN ACOUSTIC MEDIUM BETWEEN THE TRANSDUCER AND FIBER.

BROAD-COM INC
900 CORPORATE DR
MAHWAH, NJ 07430
CONTRACT NUMBER: F9628-87-C-0179
JOSEPH KADIN

TITLE:
SYNAPSISTEM DEVELOPMENT
TOPIC# 36 OFFICE: ESD/XR IDENT#: 16523

(75)

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BROAD-COM PROPOSES TO DEVELOP AND FIELD TEST A UNIQUE MILLI-METER WAVE COMMUNICATION SYSTEM WHICH WILL ELIMINATE THE NEED FOR STABLE PLATFORM, SEARCH, ANTENNA SITING AND POINTING. THE SYSTEM CAN BE USED ON FLEXIBLE QUICK ERECT MASTS AND WILL SUPPLY HIGH ... HIGHLY DIRECTIONAL COMMUNICATION IN A MOBILE ENVIRONMENT. THE APPROACH IS APPLICABLE TO MULTIPLE BEAM, RECONSTITUTABLE NETWORKING FOR BOTH TERRESTRIAL, SATELLITE AND AIRBORNE USE.

CAMBRIDGE RESEARCH & INSTRUMENTATION INC
21 ERIE ST
CAMBRIDGE, MA 02139
CONTRACT NUMBER: F19628-87-C-0110
PETER V FOUKAL

TITLE:

AN ELECTROGRAPH FOR MEASUREMENT OF ELECTRIC FIELDS IN SOLAR PLASMA STRUCTURES

TOPIC# 183 OFFICE: AFGL/XOP IDENT#: 16580

MACROSCOPIC ELECTRIC FIELDS PLAY A CENTRAL ROLE IN THE PROCESSES OF RECONNECTION AND PARTICLE ACCELERATION THAT FIGURE PROMINENTLY IN SOLAR-TERRESTRIAL PHYSICS STUDIES OF FLARES AND FILAMENT ERUPTIONS. DETECTION OF THESE FIELDS AND MEASUREMENT OF THEIR MAGNITUDE, ORIENTATION, SPATIAL DISTRIBUTION, AND TIME DEPENDENCE WOULD OPEN A NEW AREA OF INVESTIGATION IN SOLAR PLASMA DIAGNOSTIC TECHNIQUES. WE HAVE DEVELOPED A NEW TECHNIQUE FOR REMOTE SENSING OF TRANSVERSE ELECTRIC FIELDS USING THE POLARIZATION-DEPENDENCE OF HYDROGEN-LINE STARK BROADENING. RESULTS FROM OUR PHASE I RESEARCH INDICATE A SENSITIVITY BELOW 10 VOLTS cm(-1) IS ACHIEVED, AND ANOTHER ORDER OF MAGNITUDE IMPROVEMENT CAN BE EXPECTED. WE PROPOSE IN PHASE II TO FINALIZE DESIGN AND CONSTRUCT FOCAL PLANE INSTRUMENTATION (AN "ELECTROGRAPH") OPTIMIZED FOR EFFICIENT MEASUREMENT OF ELECTRIC FIELDS IN A WIDE RANGE OF SOLAR ACTIVE PHENOMENA. WE PLAN TO INSTALL AND TEST THIS ELECTROGRAPH AT THE 40 cm CORONOGRAPH OF THE SACRAMENTO PEAK OBSERVATORY, AND USE IT TO OBSERVE ELECTRIC FIELDS IN FLARES, MAGNETIC LOOPDS, AND ERUPTIVE PROMINENCES DURING THE RISING PHASE OF CYCLE 22. OUR RESULTS WILL DIRECTLY IMPROVE UNDERSTANDING OF PARTICLE ACCELERATION AND ENERGY RELEASE MECHANISMS OF IMPORTANCE TO SOLAR-TERRESTRIAL COUPLINGS.

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CASCADE MICROTECH INC
14255 SW BRIGADOON CT - STE C
BEAVERTON, OR 97005
CONTRACT NUMBER: F33615-89-C-1012
K REED GLEASON
TITLE:
NONINVASIVE ELECTRO-OPTIC PROBING FOR MMIC
TOPIC# 140 OFFICE: AFWAL/AA IDENT#: 16707

PHASE I WORK SHOWED THE FEASIBILITY OF USING A CW LASER AND A FAST PHOTODETECTOR WITH CONVENTIONAL MICROWAVE INSTRUMENTATION TO PERFORM NONINVASIVE INTERNAL NODE PROBING OF GaAs IC'S. THE WORK OF PHASE I WILL BE EXTENDED TO APPLY TO MICROSTRIP MMIC'S AND TO PROVIDE IMPROVED PERFORMANCE. THE RESULT WILL BE A NONINVASIVE PROBING SYSTEM WITH BANDWIDTH, SIGNAL TO NOISE RATIO, AND ACCURACY SUFFICIENT TO BENEFIT MMIC DEVELOPMENT. AN OPTICAL HEAD CONTAINING THE LASER, DETECTOR, AMPLIFIERS, ETC. WILL BE OPTIMIZED. THE OPTICAL HEAD WILL BE INTERFACED TO ONE OF TWO POSSIBLE OPTICAL PATHS: A DIRECT TOPSIDE PATH, WHERE THE LASER BEAM IS DIRECTED THROUGH A MICROSCOPE AND INTERACTS WITH THE GaAs DIRECTLY; AND AN EXTERNAL CRYSTAL/OPTICAL FIBER PATH, WHERE THE LASER BEAM TRAVELS DOWN AN OPTICAL FIBER AND INTO AN E-O CRYSTAL WHICH IS IN CONTACT WITH THE GaAs SURFACE.

CERAMATEC INC
2425 S 900RD W
SALT LAKE CITY, UT 84119
CONTRACT NUMBER: F33615-88-C-3219
RAYMOND A CULTER
TITLE:
DEVELOPMENT OF A MICROCIRCUIT GRID TECHNIQUE FOR AUTOMATED CRACK LENGTH MEASUREMENT FOR FATIGUE TESTING AT ELEVATED TEMPERATURES
TOPIC# 110 OFFICE: AFWAL/FI IDENT#: 16665

A MICROCIRCUIT GRID TECHNIQUE WAS INVESTIGATED AND USED TO MEASURE CRACK LENGTHS IN FATIGUE CRACK GROWTH TEST SPECIMENS OF AN ALUMINUM ALLOY (7075-T6) AT ROOM TEMPERATURE AND A Ni-BASED SUPERALLOY AT

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650 DEG C AS PART OF PHASE I OF A THREE PHASE SMALL BUSINESS INNOVATION RESEARCH PROGRAM SUPPORTED BY THE AIR FORCE. CRACK LENGTHS WERE DETERMINED FROM STEPWISE CHANGES IN THE RESISTANCE OF MICRO-CK CIRCUIT GRIDS DEPOSITED ON COMPACT TENSION SPECIMENS BY A PHOTO-LITHOGRAPHY PROCESS. CRACK LENGTHS ASSESSED FROM DISCRETE VOLTAGE CHANGES RECORDED FOR A GRID BRIDGE CIRCUIT BOTH THE ALLOYS WERE IN AGREEMENT WITH THE DATA IN THE LITERATURE. NEW INNOVATIVE CONCEPTS FOR GRID DESIGN TO OBTAIN MORE UNIFORM RESISTANCE CHANGES FOR THE INDIVIDUAL GRID LINES WERE DEVELOPED. PHASE II OF THE RESEARCH PROGRAM WILL BE DIRECTED TO IMPROVING THE RELIABILITY OF THE GRID DEPOSITION PROCEDURE, APPLYING THE NEW GRID DESIGNS IN HIGHER TEMPERATURE FATIGUE CRACK GROWTH TESTS, AND INTERFACING THE GRID WITH A MINICOMPUTER FOR AUTOMATIC DATA ACQUISITION AND ANALYSIS. THE ADVANTAGES OF THE MICROCIRCUIT GRID TECHNIQUE AS COMPARED TO OTHER TECHNIQUES FOR MONITORING CRACK LENGTHS INCLUDE: HIGH CRACK LENGTH RESOLUTION (\sim OR \approx 5 μ m), APPLICABILITY AT ELEVATED TEMPERATURES BY AN APPROPRIATE SELECTION OF CONDUCTING MATERIAL FOR THE GRIDS, LACK OF A NEED FOR QUANTITATIVE CALIBRATION OF THE VOLTAGE OUTPUT AND COMPATIBILITY FOR AUTOMATED DATA ACQUISITION AND ANALYSIS.

COMPLERE INC
PO BOX 1697
PALO ALTO, CA 94302
CONTRACT NUMBER: F33615-88-C-3014
DR F K OWEN
TITLE:
TURBULENT SHEAR STRESS MEASUREMENTS IN HYPERSONIC FLOW
TOPIC# 120 OFFICE: AFWAL/FI IDENT#: 16680

FUTURE PROGRESS IN THE COMPUTATION OF HYPERSONIC FLOW FIELDS IS RESTRICTED BY THE NEED FOR A RELIABLE TURBULENCE MODELING DATA BASE WHICH COULD BE USED FOR THE DEVELOPMENT OF EMPIRICAL MODELS FOR USE IN NAVIER-STOKES CODES. CURRENTLY, THERE ARE FEW COMPRESSIBLE FLOW MEASUREMENTS WHICH COULD BE USED FOR THIS PURPOSE AND, SINCE ADDITIONAL SHEAR STRESS TERMS MAY BE SIGNIFICANT AT HIGH MACH NUMBERS, MODELS BASED ON INCOMPRESSIBLE MEASUREMENTS MAY NOT BE REALISTIC. AN EVALUATION OF THESE ADDITIONAL TERMS WILL REQUIRE NEW EXPERIMENTAL METHODS. IN PHASE I, A TECHNIQUE WHICH COMBINES THE

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MODELS BASED ON INCOMPRESSIBLE MEASUREMENTS MAY NOT BE REALISTIC. ADVANTAGES OF HOT WIRE AND LASER VELOCIMETRY FOR THE MEASUREMENT OF THE ADDITIONAL SHEAR STRESS TERMS IN HYPERSONIC FLOW WAS DEMONSTRATED, AND MEASUREMENTS WERE OBTAINED IN A $M=6$ SHEAR FLOW. IN PHASE II, THE WORK WILL BE EXTENDED TO HIGHER MACH NUMBERS WHERE THE COMPRESSIBLE SHEAR STRESS TERMS SHOULD HAVE ADDITIONAL SIGNIFICANCE. A NEW INSTRUMENT WILL BE BUILT AND USED TO OBTAIN MEASUREMENTS IN A VARIETY OF TEST CONFIGURATIONS IN THE 20 IN. HYPERSONIC WIND TUNNEL. THESE TESTS WILL BE DESIGNED TO GENERATE A RELIABLE FLOW FIELD MODELING DATA BASE FOR HYPERSONIC FLOWS.

COMPUTATIONAL MECHANICS CORP
3601 A CHAPMAN HWY
KNOXVILLE, TN 37920
CONTRACT NUMBER:
DR A J BAKER
TITLE:
A FINITE ELEMENT PNS AERODYNAMICS CODE
TOPIC# 228 OFFICE: BMO/MYSC IDENT#: 16780

THE PROJECT SCOPE IS TO DESIGN, ORGANIZE, CONSTRUCT, VERIFY AND DELIVER TO BMO A ROBUST, CRAY II-EFFICIENT THREE-DIMENSIONAL PARABOLIC NAVIER-STOKES (PNS) AERODYNAMICS CODE FOR ANALYSIS OF REENTRY FLOWFIELDS. GEOMETRIC VERSATILITY WILL ACCRUE TO THIS CODE VIA A FINITE ELEMENT CFD CONSTRUCTION. THE DEVELOPED TAYLOR WEAKE STATEMENT (TWS) THEORETICAL FRAMEWORK IDENTIFIES ROBUST ALGORITHM STABILITY CHARACTERISTICS APPLICABLE TO A VARIETY OF FINITE ELEMENT BASES; EG., TETRAHEDRA, HEXAHEDRA, LINEAR/QUADRATIC DEGREE, ETC. WELL-POSEDNESS WILL ACCRUE TO TWS ALGORITHM EMBEDDING WITHIN A THREE-DIMENSIONAL GLOBAL PRESSURE-RELAXATION FRAMEWORK, WHEREBY APPROPRIATE REDUCED FORMS OF THE COMPLETE REYNOLDS-AVERAGED NAVIER-STOKES (RNS) EQUATIONS ARE LOCALLY SELECTABLE AS A FUNCTION OF FLOW CHARACTER. APPLICABILITY TO DESIGN STUDIES WILL BE ENSURED VIA CODE DESIGN FOR TURBULENCE CLOSURE MODEL EXPANSIBILITY; THE BASELINE FORM WILL BE A TWO-EQUATION $k-\epsilon$ WITH ALGEBRAIC REYNOLDS STRESS MODEL, WITH PARTICULAR ATTENTION TO ADEQUATE DISCRETIZATION FOR WALL-SHEAR STRESS/HEAT TRANSFER CHARACTERIZATION.

CREARE INC
PO BOX 71 - ETNA RD
HANOVER, NH 03755
CONTRACT NUMBER: F29601-87-C-0042
CHRISTOPHER J CROWLEY
TITLE:
EXPERIMENTAL HARDWARE TO DEMONSTRATE A TWO-PHASE THERMAL SYSTEM FOR SPACECRAFT
TOPIC# 200 OFFICE: AFWL/PRC IDENT#: 16615

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PLANNED AND FUTURE MISSIONS FOR SPACECRAFT REQUIRE THERMAL TRANSPORT AND POWER SYSTEMS WITH HIGH RELIABILITY AND HIGHER HEAT TRANSPORT RATES THAN PRESENT SINGLE-PHASE SYSTEMS. TWO-PHASE THERMAL LOOPS BASED ON RANKINE (OR BOILING AND CONDENSING) CYCLES ARE BEING CONSIDERED FOR THESE APPLICATIONS BECAUSE OF THEIR HIGH POWER OUTPUT PER UNIT MASS OR VOLUME. PHASE I OF THIS PROJECT HAS REVIEWED DESIGN METHODS FOR TWO-PHASE FLOW AND HEAT TRANSFER FOR THE COMPONENTS OF TWO-PHASE SYSTEMS OPERATING IN A MICROGRAVITY ENVIRONMENT. WHILE EXISTING BASIC DATA ON TWO-PHASE FLOWS IN MICROGRAVITY CONTINUES TO BE DEVELOPED, OUR OPINION IS THAT IT IS POSSIBLE TO DESIGN TWO-PHASE SYSTEMS USING EXISTING KNOWLEDGE. THAT IS BECAUSE THE EXISTING DATA SHOW THAT (1) TWO-PHASE FLOW PATTERNS ARE FOR THE MOST PART SIMPLER IN MICROGRAVITY THAN AT EARTH GRAVITY, AND (2) HEAT TRANSFER (BOILING AND CONDENSATION) PROCESSES CAN BE DESIGNED TO BE INDEPENDENT OF THE EFFECTS OF GRAVITY. THIS PHASE II PROPOSAL IS FOR AN EXPERIMENTAL TWO-PHASE PACKAGE APPLYING THE DESIGN APPROACHES SUGGESTED IN PHASE I AND DEMONSTRATING THAT SUCH A SYSTEM CAN OPERATE EFFECTIVELY UNDER MICROGRAVITY AND VARIABLE GRAVITY CONDITIONS.

CRYSTAL SYSTEMS INC

27 CONGRESS ST

SALEM, MA 01970

CONTRACT NUMBER: F33615-88-C-5510

DR CHANDRA P KHATTAK

TITLE:

GROWTH OF GaAs CRYSTALS BY HEM(TM) FOR MICROWAVE DEVICE APPLICATIONS

TOPIC# 93

OFFICE: AFWAL/ML

IDENT#: 16638

CURRENTLY GaAs WAFERS USED FOR MICROWAVE DEVICES ARE PRODUCED FROM CRYSTALS GROWN USING THE LIQUID ENCAPSULATED CZOCHRALSKI (LEC) PROCESS. SEMI-INSULATING CRYSTALS CAN BE PRODUCED WITHOUT DOPING; HOWEVER, THE DEFECT DENSITY IS VERY HIGH. FURTHER, THE ELECTRONIC PROPERTIES AND DEFECT DENSITY ACROSS LEC WAFERS EXHIBIT A W-SHAPED DISTRIBUTION. IT HAS BEEN DEMONSTRATED THAT LOW DEFECT DENSITY GaAs CRYSTALS CAN BE PRODUCED BY THE FULLY ENCAPSULATED CZOCHRALSKI (FEC) METHOD UNDER A MAGNETIC FIELD AND INDIUM ALLOYING. THESE CRYSTALS ARE LIMITED IN LENGTH; THE WAFERS EXHIBIT GROWTH STRIATIONS AND ARE

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THEREFORE NOT SUITABLE FOR MICROWAVE DEVICES. IT HAS BEEN DEMONSTRATED THAT SEMI-INSULATING (100) GaAs CRYSTALS CAN BE PRODUCED BY THE HEAT EXCHANGER METHOD (HEM) WITH VERY UNIFORM ELECTRONIC PROPERTIES IN THE INGOT. THE POTENTIAL FOR PRODUCING UNDOPED DISLOCATION-FREE GaAs CRYSTALS HAS ALSO BEEN SHOWN. SOME OF THE CHARACTERISTICS OF HEM GaAs GROWN DURING THE PHASE I PROGRAM ARE MOBILITIES EXCEEDING $7,000 \text{ cm}^2/\text{V} \cdot \text{SEC}$ FOR SEMI-INSULATING CRYSTALS, EL2 CONCENTRATION OF $1.58 \times 10^{16}/\text{cm}^3$ WITH A STANDARD DEVIATION OF ONLY 1.2% ACROSS A 3-INCH WAFER, CARBON CONCENTRATION BELOW DETECTIBILITY LIMITS ($<3 \times 10^{14}/\text{cm}^3$) AND REMARKABLE UNIFORMITY OF ELECTRONIC PROPERTIES WITHIN THE INGOT. THE PROPOSED PHASE II PROGRAM IS TO ESTABLISH TECHNOLOGY FOR PRODUCING UNDOPED, SEMI-INSULATING (100), 3-INCH DIAMETER INGOTS WITH LOW DEFECT DENSITY AND UNIFORM ELECTRONIC PROPERTIES SUITABLE FOR MICROWAVE DEVICE APPLICATIONS.

CRYSTALLUME
125 CONSTITUTION DR
MENLO PARK, CA 94025
CONTRACT NUMBER: 87-C-0327
DR K V RAVI
TITLE:
POLYCRYSTALLINE DIAMOND ELECTRONIC DEVICES
TOPIC# 14 OFFICE: AD/MNF IDENT#: 16527

THE OBJECTIVE OF THIS RESEARCH PROGRAM IS TO DEVELOP THE TECHNOLOGY OF PLASMA ENHANCED CHEMICAL VAPOR DEPOSITION (PECVD) OF POLYCRYSTALLINE DIAMOND FILMS FOR USE IN ELECTRONIC DEVICES. THE PROPOSED RESEARCH PROGRAM IS TO DEVELOP AN UNDERSTANDING OF THE MATERIALS, PROCESS AND DEVICE IMPLICATIONS OF THE USE OF POLYDIAMOND FILMS FOR FABRICATING ELECTRONIC DEVICES SUCH AS THIN FILM DIODES, TRANSISTORS AND PHOTSENSITIVE SWITCHES. KEY TECHNICAL ISSUES TO BE ADDRESSED INCLUDE CONTROL OF THE GRAIN SIZE AND STRUCTURE OF POLYDIAMOND FILMS, THE EFFECTS OF PROCESS VARIABLES SUCH AS TEMPERATURE AND PLASMA CONDITIONS ON THE STRUCTURAL AND ELECTRICAL PROPERTIES OF THE FILMS AND THE INFLUENCE OF HYDROGEN PASSIVATION ON THE ELECTRICAL PROPERTIES OF GRAIN BOUNDARIES. LIFETIME, MOBILITY, AND THE CARRIER CONCENTRATION IN DOPED AND UNDOPED DIAMOND FILMS WILL BE DETERMINED. USING ELECTRON BEAM TECHNIQUES THE EFFECTS OF GRAIN BOUNDARIES AND

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DEFECTS ON THE LOCAL RECOMBINATION OF MINORITY CARRIERS WILL BE ASSESSED. THE PHOTOCONDUCTIVITY AND CATHODOLUMINESCENCE PROPERTIES OF THE DIAMOND FILMS WILL BE CORRELATED WITH OTHER ELECTRICAL PROPERTIES AS WELL AS THE STRUCTURE. SCHOTTKY BARRIER DIODES AND MIS STRUCTURES WILL BE FABRICATED AND CHARACTERIZED. THE POTENTIAL OF ALL CARBON STRUCTURES WITH ALTERNATE LAYERS OF AMORPHOUS OR MICRO-CRYSTALLINE CARBON AND CRYSTALLINE DIAMOND WILL BE DETERMINED.

CRYSTALLUME

3180 PORTER DR - STE 2

PALO ALTO, CA 94304

CONTRACT NUMBER: F49620-89-C-0009

DR K V RAVI

TITLE:

THERMOCHEMISTRY OF HYDROCARBON DECOMPOSITION AND RELATIONSHIP TO PROPERTIES OF PECVD DIAMOND FILMS

TOPIC# 241 OFFICE: AFOSR/XOT IDENT#: 16550

THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO CONDUCT COORDINATED RESEARCH ON PLASMA ENHANCED CHEMICAL VAPOR DEPOSITION OF THIN FILM DIAMOND, EMPHASIZING THE INTERRELATIONSHIP BETWEEN EXTERNALLY CONTROLLED VARIABLES - THE REACTOR GEOMETRY AND THE VAPOR PHASE CHEMISTRY, AND THE STRUCTURE AND PROPERTIES OF THE DEPOSITED FILMS. THE DEPOSITION PROCESS WILL BE CONDUCTED USING CONVENTIONAL REACTANTS (METHANE/HYDROGEN MIXTURES) AS WELL AS NON CONVENTIONAL REACTANTS SUCH AS HYDROCARBONS OTHER THAN METHANE, AND A MIXTURE OF ENHANCEMENT METHODS INCLUDING DC, MICROWAVE AND COMBINATIONS THEREOF. THE REACTOR GEOMETRY WILL BE CONFIGURED IN SUCH A MANNER AS TO PERMIT IN SITU CHARACTERIZATION OF THE PLASMA. THE KEY EXTERNALLY CONTROLLABLE VARIABLES - THE GAS COMPOSITION, AMBIENT PRESSURE, FLOW RATE, REACTOR GEOMETRY, AND ENHANCEMENT CONDITIONS - WILL BE CORRELATED WITH THE VAPOR PHASE CHEMISTRY, AS ELUCIDATED BY OPTICAL AND MASS SPECTROSCOPY METHODS. THESE CONDITIONS WILL IN TURN BE RELATED TO THE STRUCTURE AND PROPERTIES OF THE DEPOSITED FILMS, AS CHARACTERIZED BY SEVERAL METHODS, INCLUDING RAMAN SPECTROSCOPY, SCANNING ELECTRON MICROSCOPY, SIMS AND THE MEASUREMENT OF PHYSICAL PROPERTIES SUCH AS THERMAL CONDUCTIVITY. THE OBJECTIVE OF THE RESEARCH IS TO ESTABLISH A QUANTITATIVE AND THEORETICAL BASIS FOR THE KINETICS OF GROWTH AND THE STRUCTURE AND PROPERTIES OF PECVD DIAMOND FILMS.

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CSA ENGINEERING INC
560 SAN ANTONIO RD - STE 101
PALO ALTO, CA 94306
CONTRACT NUMBER: F33615-88-C-3220
DR WARREN C GIBSON
TITLE:
SUPPORTING FINITE ELEMENT MODELS OF UNITED STATES AIR FORCE
AIRCRAFT
TOPIC# 111 OFFICE: AFWAL/FI IDENT#: 16669

PHASE I HAS SHOWN THAT THE AIR FORCE IS NOT GETTING FULL VALUE FOR THE RESOURCES EXPENDED ON FINITE ELEMENT MODELS OF AIRCRAFT STRUCTURES. MODELS ARE OFTEN NOT AVAILABLE WHEN NEEDED FOR ANALYSIS OF AIRCRAFT MODIFICATIONS, REVISED STORES, DAMAGE STUDIES, OR TECHNOLOGY VALIDATION. A MIL STANDARD WAS PROPOSED TO BE USED FOR AIR FORCE ACQUISITION OF MODELS GENERATED BY CONTRACTORS. A CENTRALIZED ACTIVITY WAS PROPOSED FOR THE PURPOSE OF COLLECTING, VALIDATING, DOCUMENTING, MODIFYING, AND DISTRIBUTING SUCH MODELS. PHASE II WILL EXPAND AND IMPLEMENT THE IDEAS PROPOSED IN PHASE I. SOFTWARE WILL BE DEVELOPED FOR FINITE ELEMENT DATABASES, USING EXISTING TOOLS WHERE POSSIBLE. MODELS WILL BE ACQUIRED FROM OTHER AIR FORCE AGENCIES AND WILL BE USED TO DEVELOP AND DEMONSTRATE THE METHODOLOGY AND SOFTWARE. THE WORK DONE ON THESE MODELS IS EXPECTED TO BE USEFUL TO FDL IN ITS OWN RIGHT. PLANS FOR PERMANENT OPERATION OF A MODEL CENTER WILL BE PREPARED.

CSA ENGINEERING INC
560 SAN ANTONIO RD - STE 101
PALO ALTO, CA 94306
CONTRACT NUMBER:
KEVIN E SMITH
TITLE:
DEVELOPMENT OF A DYNAMIC PRESSURE CALIBRATOR
TOPIC# 22 OFFICE: AEDC/DOT IDENT#: 17450

SEVERAL CLASSES OF DYNAMIC PRESSURE SENSORS ARE USED IN TURBINE

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AND ROCKET ENGINE DEVELOPMENT. IT IS PROPOSED TO DEVELOP CALIBRATORS FOR TWO COMMON CLASSES OF DEVICES: TUBE-MOUNTED AND RAKES. CURRENT CALIBRATORS ARE RESTRICTED IN ULTIMATE PEAK PRESSURE, BANDWIDTH, ACCURACY, AND TYPE OF EXCITATION SOURCE. IT IS PROPOSED TO DESIGN, BUILD, AND TEST LABORATORY-SCALE CALIBRATION SYSTEMS WITH FLEXIBLE EXCITATION SOURCES (SWEPT-SINE OR RANDOM), HIGH BANDWIDTH (2-500 Hz FOR THE TUBE-MOUNTED TYPE, AND 10-2500 Hz FOR THE RAKE TYPE), AND HIGH PEAK PRESSURE (1 psi). THE CALIBRATORS WILL UTILIZE HIGH-OUTPUT ACOUSTIC DRIVERS CONTROLLED BY A DIGITAL SERVO-CONTROLLER. IN ADDITION TO PROVIDING A PRECISELY CONTROLLED EXCITATION, A TWO-CHANNEL MEASUREMENT (SENSOR OUTPUT DUE TO DRIVING PRESSURE AT TUBING INPUT) WILL PRODUCE A VERY ACCURATE CALIBRATION BOTH IN TERMS OF AMPLITUDE AND PHASE.

CVD EQUIPMENT CORP
160-B W INDUSTRY CT
DEER PARK, NY 11729
CONTRACT NUMBER: 19628-87-C-0153
BILL GARTMAN
TITLE:
ABRUPT JUNCTION MOCVD EPITAXIAL REACTOR
TOPIC# 58 OFFICE: RADC/XPX IDENT#: 16218

PRESENT TECHNOLOGY USED TO FORM EPITAXIAL LAYERS OF III-V COMPOUNDS IS LIMITED TO (1) ADDITIONAL ATMOSPHERIC AND REDUCED PRESSURE METAL ORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD) REACTORS, WHICH FAIL TO ACHIEVE THE DEGREE OF LAYER ABRUPTNESS AND UNIFORMITY REQUIRED OF SUPER-LATTICE STRUCTURES, OR (2) MOLECULAR BEAM EPITAXIAL (MBE) REACTORS WHICH SUFFER FROM LIMITED THROUGHPUT CAPABILITY. UNDER PHASE I WE DEVELOPED A RAPID GAS-SWITCHING, SUBSTRATE-SWITCHING, AND THERMAL CYCLING REACTOR SYSTEM WHICH IS CAPABLE OF BOTH TRADITIONAL MOCVD AND ATOMIC LAYER EPITAXIAL (ALE) GROWTH TECHNIQUES. THE OBJECTIVE UNDER PHASE II IS TO PERFECT THE GROWTH PERFORMANCE ASPECTS OF A TEST SYSTEM BUILT BY CVD EQUIPMENT CORPORATION, AND THEN PROVIDE TO THE AIR FORCE A PROTOTYPE PRODUCTION SYSTEM FOR ACTUAL DEVICE PROCESS DEVELOPMENT.

DECISION-SCIENCE APPLICATIONS INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER: 19628-87-C-0135
PHILIP G TOMLINSON
TITLE:
BISTATIC TARGET DETECTION IN CLUTTER
TOPIC# 37 OFFICE: RADC/XPX IDENT#: 16201

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DCA IS PROPOSING TO PERFORM MODELING AND SIMULATION OF BISTATIC TARGET DETECTION IN CLUTTER WHICH APPLIED AS WELL TO MONOSTATIC RADAR. THE PROPOSED EFFORT BUILDS UPON MODELING AND SIMULATION DEVELOPED IN THE PHASE I STUDY. IN ALL, FIVE TASKS ARE PROPOSED, INCLUDING ADDITIONAL THEORY AND ALGORITHM DEVELOPMENT, DETAILED SIMULATION OF DETECTION PROBABILITY IN NON-RAYLEIGH CLUTTER, TO INCLUDE CFAR AND MORE GENERAL CLUTTER STATISTICS IN THE EXISTING BISTATIC RADAR ANALYSIS AND DEVELOPMENT SOFTWARE, BRADS. OTHER MODIFICATIONS OF BRADS TO INCREASE THE EFFICIENCY OF MONOSTATIC CASES AND OVERALL QUALITY AND UTILITY, SUBJECT TO DIRECTION AND APPROVAL OF RADC/EE. THESE INCLUDE A GENERAL MODEL OF DETECTION OF TARGETS IN CLUTTER AND NOISE FOR A WIDE VARIETY OF TARGET AND CLUTTER DISTRIBUTIONS AND CORRELATIONS, AND NUMBERS OF PULSES INTEGRATED; A SIMULATION OF CFAR ALGORITHMS BASED UPON SIMULATED CLUTTER MAPS PRODUCED BY BRADS; AND FINALLY, THE DETECTION MODELS IN BRADS ITSELF WILL BE MODIFIED TO REFLECT BETTER CLUTTER STATISTICS AND CFAR PERFORMANCE.

DECISION-SCIENCE APPLICATIONS INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER: F04701-87-C-0115
ERIC S BAKER

TITLE:

DSAR SYSTEM EVALUATION STATION

TOPIC# 177 OFFICE: SD/SPO IDENT#: 16574

THE DISTRIBUTED SPARSE ARRAY RADAR (DSAR) CONCEPT IS A MODULAR SPACE BASED RADAR CONCEPT THAT IS POTENTIALLY CAPABLE OF DETECTING LOW OBSERVABLE TARGETS IN THE PRESENCE OF CLUTTER AND JAMMING. FOR THIS PHASE II WORK, DSA WILL BUILD UPON THE ANALYSIS RESULTS OF TWO PREVIOUS SBIR PHASE I EFFORTS RELATED TO DSAR SIGNAL PROCESSING AND COHERENCE TECHNIQUES. WE WILL DESIGN, DEVELOP AND DEMONSTRATE AN INTEGRATED ENVIRONMENT TO EVALUATE OVERALL DSAR SYSTEM PERFORMANCE -- THE DSAR SYSTEM EVALUATION STATION (DSAR/SES). THE DSAR/SES WILL ALLOW INTERACTIVE CAPABILITIES AND FLEXIBILITY TO SUPPORT DSAR SYSTEM STUDIES. IT WILL PROVIDE A TOOL FOR EVALUATING THE VALIDITY OF EARLIER MODELING ASSUMPTIONS, FOR ANALYZING AND DEMONSTRATING DSAR

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SIGNAL PROCESSING ALGORITHMS AND TECHNIQUES, AND FOR ADDRESSING
SPECIFIC DSAR SYSTEM TECHNICAL ISSUES IN AN INTEGRATED ENVIRONMENT.

DEFENSE SYSTEMS INC
7903 WESTPARK DR
McLEAN, VA 22102
CONTRACT NUMBER: F04701-87-C-0110
DR RICHARD FLEETER

TITLE:
EXPANDING THE APPLICATIONS OF MINIATURE SATELLITE TECHNOLOGIES
TOPIC# 167 OFFICE: AFSTC/OL-AB IDENT#: 16559

MINIATURE SATELLITE TECHNOLOGY (MST) IS PROVIDING AN INEXPENSIVE,
RAPID DEPLOYMENT ALTERNATIVE TO CONVENTIONAL SPACE SYSTEMS FOR
APPLICATIONS WITH VERY MODEST BUS REQUIREMENTS. FURTHER PROGRESS IN
MST DEPENDS CRITICALLY ON EXPANDING PAYLOAD SUPPORT CAPABILITIES
(E.G., STABILIZATION, POWER AND PROPULSION) WHILE MAINTAINING LOW
COST. AN IMPORTANT CONCLUSION OF THE PHASE I EFFORT WAS THAT NO
TRULY UNIVERSAL BUS EXISTS WITHIN MST. HOWEVER IT WAS FOUND THAT THE
LOW COST AND RAPID PROGRAMMATICS WHICH MOTIVATED THE SEARCH FOR
UNIVERSALITY ARE AVAILABLE THROUGH MODULARITY. IN PHASE II DSI
PROPOSES TO COMPLETE THE DESIGN OF SUCH A MODULAR MST BUS THROUGH
CDR LEVEL, BUILD AND TEST SELECTED CRITICAL SUBSYSTEMS, AND SUPPORT
A FUNDED DoE PAYLOAD WHICH WOULD BE THE FIRST TO USE THE MST BUS.
THE DESIGN FEATURES MODULAR POWER, PROPULSION, DIGITAL BUFFERING,
STABILIZATION AND CONTROL SYSTEMS AND SUPPLIES OVER 40 WATTS TO A
2 - AXIS STABILIZED PAYLOAD OF UP TO 100 lbm WITH A VOLUME UP TO 5050
CUBIC INCH (2.92 CUBIC FOOT) VOLUME. A CENTRAL FEATURE OF THE
DESIGN IS A LOW POWER, 750 Mbit DIGITAL DATA BUFFER.

DESIGN ENGINEERING CORP
4725 LUMBER AVE NE - STE 1
ALBUQUERQUE, NM 87109
CONTRACT NUMBER: F29601-87-C-0048
HANS J TAUSCH JR

TITLE:
HIGH POWER MICROWAVE (HPM) INTEGRATED CIRCUIT SCREENING
CRITERIA
TOPIC# 196 OFFICE: AFWL/PRC IDENT#: 16611

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WE WILL DESIGN, BUILD AND TEST HIGH POWER MICROWAVE (HPM) POWER FLOW SENSORS AND ASSOCIATED INSTRUMENTATION. THE SENSORS WILL BE DESIGNED FOR MOUNTING ON PRINTED CIRCUIT (PC) BOARDS SO THAT POWER FLOWING INTO OR OUT OF COMPONENTS ON THE PC BOARD CAN BE MONITORED. THE SENSORS WILL NOT REQUIRE ELECTRICAL POWER, WILL NOT AFFECT THE FREE FIELD HPM SIGNAL SURROUNDING THE PC BOARD, AND WILL NOT SIGNIFICANTLY ALTER THE INTERACTION OF THE HPM SIGNAL WITH THE COMPONENT BEING TESTED. PRELIMINARY SPECIFICATIONS FOR THE SENSORS ARE AS FOLLOWS: MAXIMUM VOLTAGE: 1000 VOLTS; MAXIMUM RMS CURRENT: 37.4 AMPS FOR 100ns; MAXIMUM POWER DETECTION: 10k WATTS; DYNAMIC RANGE: 60db; LINEARITY: 1%; RESPONSE (10 - 90%): 5ns AND PHYSICAL DIMENSIONS: .625cm SQUARE BY .25cm THICK.

DISPLAYTECH INC
2200 CENTRAL AVE - STE C
BOULDER, CO 80301
CONTRACT NUMBER: 30602-87-C-0065
MARK HANDSCHY
TITLE:
PROGRAMMABLE OPTICAL SPATIAL FILTERS USING ARRAYS OF
FERROELECTRIC LIQUID CRYSTAL LIGHT VALVES
TOPIC# 63 OFFICE: RADC/XPX IDENT#: 16223

THE PROPOSED WORK AIMS TO DEVELOP PROGRAMMABLE OPTICAL SPATIAL FILTERS USING NOVEL SPATIAL LIGHT MODULATORS (SLM) MADE FROM LINEAR ARRAYS OF FERROELECTRIC LIQUID CRYSTAL (FLC) LIGHT VALVES. THE FLC TECHNOLOGY ALLOWS SIMPLE, ECONOMICAL FABRICATION OF SLMs WITH A LARGE NUMBER OF ELEMENTS THAT CAN EASILY BE ADDRESSED EITHER ELECTRONICALLY OR OPTICALLY. THE ELEMENTS EFFICIENTLY SWITCH INCIDENT LIGHT WITH SUBMICROSECOND RESPONSE TIMES. PHASE I OF THE PROPOSED EFFORT DEMONSTRATED THE FEASIBILITY OF USING FLC TECHNOLOGY FOR FAST, HIGH CONTRAST SPATIAL FILTERS. PHASE II SEEKS TO DEVELOP A PRACTICAL PROTOTYPE OPTICAL SPATIAL FILTER USING A PAIR OF THESE SLMs OPTICALLY COUPLED TOGETHER AND COMPACTLY PACKAGED. THE COMPLETED DEVICE WILL BE A 200 ELEMENT ELECTRICALLY ADDRESSED LINEAR ARRAY SLM WITH CONTRAST RATIOS OF 10(6):1.

DISPLAYTECH INC
2200 CENTRAL AVE - STE A
BOULDER, CO 80301
CONTRACT NUMBER: F33615-89-C-5602
MICHAEL D WANND
TITLE:
MATERIALS FOR FERROELECTRIC LIQUID CRYSTAL INTEGRATED OPTICAL SWITCHES
TOPIC# 92 OFFICE: AFWAL/ML IDENT#: 16637

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FERROELECTRIC LIQUID CRYSTALS EXHIBIT LOW VOLTAGE, LOW POWER ELECTRO-OPTIC SWITCHING WITH VERY FAST (MICROSECOND) RESPONSE. FLCs CAN BE EMPLOYED IN A SIMPLE GEOMETRY TO MAKE ARRAYS OF ELECTRO-OPTIC WAVEGUIDE COUPLING SWITCHES, SUITABLE FOR MULTI-INPUT, MULTI-OUTPUT APPLICATIONS. THE PROPOSED WORK WOULD DEVELOP HIGH TILT (~45 DEG), HIGH BIREFRINGENCE ($n \sim .3$) FLC MATERIALS AND REFRACTIVE INDEX MATCHED WAVEGUIDE POLYMERS SUITABLE FOR FABRICATION OF AN INTEGRATED OPTIC DEVICE.

DYNA EAST CORP
3201 ARCH ST
PHILADELPHIA, PA 19104
CONTRACT NUMBER: 87-C-0360
WILLIAM J FLIS

TITLE:

EXPLOSIVE RESPONSE TO UNPLANNED STIMULI

TOPIC# 1 OFFICE: AFATL/MNN IDENT#: 16530

MOST AIR FORCE MUNITIONS ARE SENSITIVE TO INITIATION BY FRAGMENT OR BULLET IMPACT AND SYMPATHETIC DETONATION. SINCE WARHEADS IN PARTICULAR ARE OFTEN LOADED WITH VERY ENERGETIC EXPLOSIVE TO OBTAIN THE MAXIMUM PENETRATOR PERFORMANCE AT THE EXPENSE OF INCREASED SENSITIVITY, A MEANS OF REDUCING MUNITION SENSITIVITY MUST BE DETERMINED. PREVIOUS PROGRESS TO "FIX" VARIOUS SYSTEMS, PRIMARILY IN THE STORAGE CONFIGURATION, HAVE FAILED BECAUSE OF A LACK OF UNDERSTANDING OF THE ENERGY TRANSFER AND ENERGY RELEASE PROCESSES ASSOCIATED WITH THE STIMULI AND MUNITION RESPONSE. IN THIS PROGRAM WE WILL ADDRESS, FOR A LIMITED SET OF STIMULI, THE ENERGY TRANSPORT AND RELEASE PROCESSES. WE WILL DEVELOP ANALYTICAL AND EXPERIMENTAL TOOLS TO IMPROVE OUR UNDERSTANDING OF THESE PROCESSES AND TO EVENTUALLY PROVIDE GUIDANCE TO THE MUNITION SYSTEM OR PACKAGING SYSTEM DESIGNER.

DYNAMIC CONTROLS INC
7060 CLIFFWOOD PL
DAYTON, OH 45424
CONTRACT NUMBER: F33615-89-C-3401
DR GAVIN D JENNEY

TITLE:

INTEGRATED TEST SYSTEM - AIRCRAFT GROUND OPERATION STUDY

TOPIC# 116 OFFICE: AFWAL/ML IDENT#: 16676

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THE OBJECTIVE OF THE PROJECT IS TO PROVIDE A DETAIL DEFINITION OF A TEST SYSTEM FOR EVALUATING FULL SCALE LANDING GEAR. THE DEFINITION WILL ALLOW PROCUREMENT, INSTALLATION AND CHECK-OUT OF A FULL-SCALE LAND GEAR TEST SYSTEM IN THE LANDING GEAR DEVELOPMENT FACILITY ON WRIGHT-PATTERSON AIR FORCE BASE AS AN UPGRADE TO AN EXISTING TEST MACHINE. WHILE THE PHASE I EFFORT RESULTED IN THE GENERAL DEFINITION OF A SUITABLE TEST SYSTEM AND ESTABLISHED GENERAL FEASIBILITY, THE PROPOSED EFFORT IS REQUIRED TO REFINE THE TEST SYSTEM PRIOR TO INSTALLATION AS A PHASE III EFFORT. BECAUSE OF THE POTENTIAL LEVEL OF INVESTMENT REQUIRED FOR PHASE III INSTALLATION, THIS REFINEMENT WILL HAVE A SIGNIFICANT PAYOFF IN GENERATING THE BEST POSSIBLE TEST STATION UPGRADE BASED UPON THE FACTORS: COST OF THE MACHINE; RANGE OF CAPABILITIES PROVIDED; THE IMPORTANCE OF THE PROBLEMS THAT CAN BE SOLVED BY THE MACHINE; COST OF INDIVIDUAL TESTS; ACCURACY AND RELIABILITY. THE PROJECT WILL ESTABLISH TEST STATION PERFORMANCE, ANALYZE COMPETING DESIGNS, VERIFY HIGH RISK AREAS BY DEMONSTRATION AND PREPARE PLANS, SPECIFICATIONS AND A COST ESTIMATE FOR THE UPGRADE SYSTEM.

E-TEK DYNAMICS INC
250 EAST DR
MELBOURNE, FL 32904
CONTRACT NUMBER: F30602-89-C-0037
J J PAN
TITLE:
FIBER OPTIC SENSORS OF ELECTRICAL AND MAGNETIC FIELDS
TOPIC# 59 OFFICE: RADC/XPX IDENT#: 16219

A WIDEBAND FIBER OPTIC ELECTROMAGNETIC FIELD SENSOR IS HIGHLY DEMANDED FOR ACCURATE MEASURING OF ELECTRIC (E) AND MAGNETIC (H) FIELDS OF ANTENNAS, ELINT/SIGINT, TARGET TRACKING, GUIDANCE/NAVIGATION, EMC, ANTISUBMARINE WARFARE, AND MANY OTHER APPLICATIONS. THE INNOVATIVE TECHNOLOGIES HAVE BEEN DEVELOPED IN PHASE I R&D FOR THE MICROWAVE, E, H, AND EH FIELD SENSORS UP TO 20 GHz. FOR PHASE II R&D, E-TEK PROPOSES TO FABRICATE/TEST/DEMONSTRATE A COMPLETE FIBER OPTIC ELECTRIC FIELD SENSOR SYSTEM WITH FREQUENCY RESPONSE FROM 100 MHz TO 10 GHz USING AUTODYNE DETECTION. THE WIDEBAND SENSOR WILL HAVE A MINIMUM SENSITIVITY OF 0.1 mV TO 1,000

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V/m AND A SYSTEM SIGNAL-TO-NOISE RATIO OF BETTER THAN 120 dB/Hz. LASER DIODE STABILIZATION OVER WIDE TEMPERATURE RANGE, LINEWIDTH/NOISE REDUCTIONS, WIDEBAND IMPEDANCE MATCHING, WIDEBAND MINIATURE ANTENNA, AND PRECISE ALIGNMENT TECHNIQUE WILL BE DEVELOPED FOR THE HIGH DYNAMIC RANGE AND REMOTELY DEPLOYABLE SENSOR.

E-TEK DYNAMICS INC
250 EAST DR - STE D
MELBOURNE, FL 32904
CONTRACT NUMBER: F33615-89-C-1003
J J PAN
TITLE:
COMPACT HIGH EFFICIENCY MULTIAPERTURE BROAD SPECTRUM SENSOR
TOPIC# 155 OFFICE: AFWAL/AA IDENT#: 16726

COMPACT, HIGH EFFICIENCY MULTIAPERTURE SENSOR USING OPTICAL PHASED-ARRAY PROVIDES MANY ATTRACTIVE AND PRACTICAL FEATURES, INCLUDING RAPID LASER BEAM STEERING OVER WIDE FIELD OF VIEW, VERY SHARP LASER BEAM, AND EFFICIENT COHERENT OPTICAL POWER COMBINING. THEORETICAL ANALYSES INDICATE THAT THIS COMPACT SENSOR IS FEASIBLE AND VIABLE FOR AVIONIC, SPACE, AND GROUND MULTIPLE-TARGET TRACKING/POINTING APPLICATIONS, FROM A FEW Km TO SEVERAL THOUSANDS OF Km DISTANCE. RANGE RESOLUTION OF 0.02 Km AND SPOT NUMBER OF MORE THAN 10(4) ARE ACHIEVABLE. COST EFFECTIVE MONOLITHIC SYSTEM FABRICATION/INTEGRATION IS CONCEIVABLE IN THE FUTURE. KEY TECHNOLOGIES OF OPTICAL PHASED-ARRAY SENSOR ARE THE ELECTRONICALLY ADJUSTABLE OPTICAL PHASE SHIFTER FABRICATION, OPTICAL WAVELENGTH SYNCHRONIZATION, AND PRECISION DEVICE ALIGNMENTS. TO VERIFY THE FEASIBILITY AND PRACTICALITY, E-TEK PROPOSES TO CONSTRUCT A 2x2 PLANAR OPTICAL PHASED-ARRAY USING Linbo(3) PHASE SHIFTERS. OPTICAL INJECTION-LOCKING WILL BE EMPLOYED TO SYNCHRONIZE THE ARRAY LASER TO A MASTER LASER. LINEWIDTH REDUCTION, WAVELENGTH/MODE/POWER STABILIZATION, AND EVEN POWER DISTRIBUTION OF MASTER LASER WILL BE PRECISELY DESIGNED AND IMPLEMENTED IN PHASE II R&D. CHARACTERISTICS OF COHERENT POWER COMBINING, LASER BEAM SHARPENING, AND FAST BEAM STEERING WOULD BE TESTED AND DEMONSTRATED.

ELECTROCHIMICA CORP
20 KELLY CT
MENLO PARK, CA 94025
CONTRACT NUMBER: 87-C-0328
DR S REISNER
TITLE:
NEW HIGH POWER STORAGE DEVICES FOR FUZES
TOPIC# 13 OFFICE: AFATL/MNF IDENT#: 16532

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STORAGE OF ELECTRICAL ENERGY AT A SUFFICIENTLY HIGH DENSITY, IN A SMALL ENOUGH VOLUME IS INCREASINGLY BECOMING IMPORTANT FOR COMPLEX FUZE REQUIREMENTS. RESULTS OF THE PHASE I PROGRAM INDICATE A NEW POWERFUL APPROACH TO THE ACHIEVEMENT OF HIGH POWER DENSITIES IN SMALL PACKAGES. THE PROPOSED PHASE II APPROACH EXPLOITS AN EXCEPTIONALLY HIGH SURFACE AREA CARBON STRUCTURE TO ACT AS A SUPPORT FOR A METAL HALIDE CATHODE OPPOSITE A LITHIUM ANODE. BOTH DOUBLE LAYER CAPACITANCE AND GALVANIC (FARADAIC AND INTERCALATION) PROCESSES CONTRIBUTE TO THE DISCHARGE CAPACITY ENABLING EXCEPTIONALLY HIGH RATES OF DISCHARGE. A FUSED SALT THERMAL TYPE RESERVE BATTERY IS PROPOSED WHICH IS ACTIVATED BY LAUNCH ACCELERATIONS ON THE ORDER OF 66,000 g, CORRESPONDING TO A PRESSURE OF ~1.0 GPa FOR THE PROPOSED BATTERY. THIS PULSE ACTIVATION PRECLUDES THE USE OF A SPACE CONSUMING MECHANICAL ACTIVATION DEVICE, AND ENABLES FACT ACTIVATION TIMES ON THE ORDER OF 1 MSEC. ACTIVATION BY LAUNCH ACCELERATION IS BASED ON THE UNIQUE METHOD OF SHOCK ACTIVATION RECENTLY SUCCESSFULLY DEMONSTRATED AT SANDIA BY GRAHAM.

EPSILON LAMBDA ELECTRONICS CORP
427 STEVENS ST
GENEVA, IL 60134
CONTRACT NUMBER: 87-C-0340
KENNETH WOOD
TITLE:
LOW COST DUAL POLARIZED 94 GHz SEEKER
TOPIC# 1 OFFICE: AFATL/SAS IDENT#: 16194

THE OBJECTIVE OF THIS PHASE II PROGRAM IS TO DEVELOP A 94 GHz MICROSTRIP DUAL POLARIZED FMCW (FREQUENCY MODULATED CONTINUOUS WAVE) FRONT END INTEGRATED ONTO A COMMON GROUND PLANE. THE DUAL POLARIZED ANTENNA WOULD BE ON ONE SIDE WITH THE POLARIZATION SELECTION NETWORK AND FMCW FRONT END ON THE REVERSE SIDE OF THE COMMON GROUND PLANE. THE SIGNAL WOULD BE FED THROUGH THE GROUND PLANE USING THE ORTHOGONAL PROBE TRANSITIONS DEMONSTRATED DURING THE PHASE I PROGRAM. THE THREE INITIAL ACTIVITIES WILL DEVELOP THE DUAL POLARIZED QUARTZ MICROSTRIP ANTENNA, THE QUARTZ MICROSTRIP POLARIZATION SELECTION NETWORK AND THE FMCW FRONT END. FINALLY, A COMPLETE UNIT WILL BE INTEGRATED, TESTED AND THEN REPLICATED.

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EPSILON LAMBDA ELECTRONICS INC
427 STEVENS ST
GENEVA, IL 60134
CONTRACT NUMBER:
DR PETER P TOULIOS
TITLE:
W-BAND HIGH-G TRANSMITTER MODULE
TOPIC# 213 OFFICE: BMO/MYSC IDENT#: 16764

THE WORK DESCRIBED IN THIS PROPOSAL WILL INVOLVE THE DEVELOPMENT OF A TRANSMITTER WHICH CONSISTS OF A GUNN DIODE OSCILLATOR, POWER SPLITTER AND ANTENNAS ABLE TO SURVIVE A 150,000 G ACCELERATION LOADING. THE COMPLETE TRANSMITTER WILL BE PACKAGED IN A PROJECTILE SHAPED HOUSING. THE DEVELOPMENT WILL INVOLVE TWO DISTINCT TECHNOLOGY METHODS, ONE USING WAVEGUIDE COMPONENTS THE OTHER USING A SOFT SUBSTRATE MICROSTRIP IMPLEMENTATION. TESTING WILL BE CONDUCTED ON THE TRANSMITTERS, THE OSCILLATORS AND THE ACTUAL GUNN DIODE DEVICES.

EXFLUOR RESEARCH CORP
PO BOX 7807
AUSTIN, TX 78713
CONTRACT NUMBER: F33615-88-C-5514
DR THOMAS R BIERSCHEK
TITLE:
THE PREPARATION OF NEW PERFLUOROPOLYETHER FLUIDS EXHIBITING EXCELLENT OXIDATIVE STABILITY
TOPIC# 95 OFFICE: AFWAL/ML IDENT#: 16642

*THE GOAL OF THIS RESEARCH PROGRAM IS TO BETTER UNDERSTAND THE RELATIONSHIP BETWEEN OXIDATIVE STABILITY AND STRUCTURE AS IT RELATES TO PERFLUOROPOLYETHERS. WE INTEND TO USE DIRECT FLUORINATION TECHNOLOGY TO PRODUCE SEVERAL NEW PERFLUOROPOLYETHER FLUIDS WHICH CONTAIN UNIQUE ARRANGEMENTS OF CARBON AND OXYGEN IN THE BACKBONE OF THE POLYMER AS WELL AS UNUSUAL PENDANT GROUPS. THE DIRECT FLUORINATION PROCESS INVOLVES THE SELECTION OF A HYDROCARBON WITH THE PROPER STRUCTURE WHICH IS CONVERTED TO A FLUOROCARBON BY A CONTROLLED

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REACTION WITH ELEMENTAL FLUORINE. SINCE THE STARTING MATERIALS ARE HYDROCARBONS, NUMEROUS STRUCTURES CAN BE MADE DUE TO THE WIDE VARIETY OF MONOMERS AND SYNTHETIC TECHNIQUES AVAILABLE. IN CONTRAST, THE SYNTHESIS OF FLUOROCARBON POLYMERS FROM FLUOROCARBON MONOMERS IS COSTLY AND THE TYPES OF REACTIONS THAT CAN BE CARRIED OUT ARE EXTREMELY LIMITED. THE PERFLUOROPOLYETHERS PRODUCED WILL HAVE A VARIETY OF USES IN ENVIRONMENTS WHERE EXTREME STABILITY, VERY LOW VAPOR PRESSURE, LOW ACUTE TOXICITY, HIGH LUBRICITY AND VERY LOW POUR POINTS ARE REQUIRED.

EXPERT-EASE SYSTEMS INC
1301 SHOREWAY RD - STE 420
BELMONT, CA 94002
CONTRACT NUMBER: F33615-87-C-5311
BJORN FROGNER

TITLE:
DEVELOPMENT OF A KNOWLEDGE-BASED INTELLIGENT TUTORING SYSTEM
TOPIC# 83 OFFICE: AMD/RDO IDENT#: 20057

THE PHASE II DEVELOPMENT OF AN INTELLIGENT TUTORING SYSTEM (ITS) FOR TRAINING IN SELECTED ASPECTS OF WEATHER ANALYSIS IS BEING PROPOSED. THIS IS THE CONTINUATION OF A SUCCESSFUL FEASIBILITY AND DEMONSTRATION OF A "WEATHER TRAINER." THE MAIN OBJECTIVE OF THIS SYSTEM IS TO ADAPTIVELY PRESENT THE AVAILABLE COURSEWARE TO THE STUDENTS IN ACCORDANCE WITH THEIR ABILITY TO GRASP THE MATERIAL. THE SYSTEM IS BASED ON THE USE OF AN EXPERT SYSTEM TO CONTAIN A DOMAIN-INDEPENDENT INSTRUCTIONAL STRATEGY AND STUDENT MODEL. AN EVIDENTIAL REASONING APPROACH WILL BE EMPLOYED TO DEAL WITH CONFLICTING EVIDENCE AND TO QUANTIFY THE UNCERTAINTIES ASSOCIATED WITH INCONCLUSIVE INFORMATION. A HYPER-TEST APPROACH WILL BE USED TO EFFECTIVELY LINK TEXT, GRAPHICAL IMAGES, QUIZZES, ETC. TWO AND THREE DIMENSIONAL COLOR GRAPHICS WILL BE USED TO TRAIN AND TEST THE STUDENTS IN INTEGRATED CONCEPTS OF WEATHER ANALYSIS.

FAIL-SAFE TECHNOLOGY CORP
5757 W CENTURY BLVD - STE 645
LOS ANGELES, CA 90045
CONTRACT NUMBER:
DR MICHAEL W SIEVERS

TITLE:
EMBEDDED FAULT-TOLERANT COMPUTER FOR STRATEGIC APPLICATIONS
TOPIC# 205 OFFICE: BMO/MYSC IDENT#: 16752

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FAIL-SAFE TECHNOLOGY PROPOSES TO DEVELOP A PROTOTYPE EMBEDDED FAULT-TOLERANT COMPUTER (EFTC). THIS COMPUTER IS BASED ON AN ARCHITECTURE DEVELOPED IN OUR PHASE I WORK. IT IS INTENDED FOR HIGHLY CRITICAL APPLICATIONS IN WHICH SMALL SIZE, WEIGHT, AND POWER IS REQUIRED. ROCKWELL INTERNATIONAL HAS SHOWN INTEREST IN PRODUCING A MILITARIZED VERSION OF THE EFTC IN A PHASE III ACTIVITY.

FLOW RESEARCH CO
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER: F33615-88-C-2904
DR SURESH MENON
TITLE:
AN EXPERIMENTAL-NUMERICAL STUDY OF MIXING ENHANCING SCRAMJET
FLAMEHOLDERS
TOPIC# 134 OFFICE: AFWAL/PO IDENT#: 16698

THE NEXT GENERATION OF SPACE TRANSPORTATION SYSTEMS, WHICH IS CURRENTLY UNDER DEVELOPMENT, INVOLVES THE APPLICATION OF A NEW FAMILY OF PROPULSION SYSTEMS KNOWN AS THE SUPERSONIC COMBUSTION RAMJET (SCRAMJET). IN THESE ENGINES, COMBUSTION OCCURS IN A SUPERSONIC AIR STREAM. FOR EFFICIENT COMBUSTION, IT IS ESSENTIAL THAT MIXING BETWEEN THE INJECTED FUEL AND THE INCOMING SUPERSONIC AIR STREAM OCCURS EFFICIENTLY. HOWEVER, PREVIOUS THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF SUPERSONIC MIXING FLOWS INDICATE THAT SUPERSONIC SHEAR FLOWS ARE VERY VIABLE, WITH THE MIXING DECREASING WITH INCREASES IN THE FLOW MACH NUMBER. THIS EXPERIMENTALLY OBSERVED FACT WAS ALSO DEMONSTRATED BY THE NUMERICAL SIMULATIONS CONDUCTED AT THE PHASE I STUDY. RECENTLY, EXPERIMENTAL EVIDENCE HAS BEEN OBTAINED INDICATING THAT IT MAY BE POSSIBLE TO ENHANCE MIXING IN SUPERSONIC FLOWS BY USING A THREE-DIMENSIONAL FLAMEHOLDER CONFIGURATION. THE PROPOSED PHASE II STUDY WILL BE A COMBINED EXPERIMENTAL-NUMERICAL PROGRAM TO INVESTIGATE FURTHER THE ENHANCED FUEL-AIR MIXING BEHIND THREE-DIMENSIONAL FLAMEHOLDERS. THIS WOULD RESULT IN THE DEVELOPMENT OF A FLAMEHOLDER CONFIGURATION THAT MAY HAVE PRACTICAL APPLICATIONS FOR THE SUCCESSFUL DEPLOYMENT OF THE SCRAMJET ENGINE. A THREE-DIMENSIONAL NUMERICAL CODE WILL ALSO BE DEVELOPED TO STUDY BOTH THE STEADY AND THE UNSTEADY FLOW FIELDS ASSOCIATED WITH THREE-DIMENSIONAL

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FLAMEHOLDERS.

FLOW RESEARCH CO
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER:
JAMES L DOYLE JR
TITLE:
BALLISTIC RANGE/TRACK ALIGNMENT DIAGNOSTICS
TOPIC# 25 OFFICE: AEDC/DOT IDENT#: 17452

THIS PROPOSAL ADDRESSES AN 18-MONTH RESEARCH AND DEVELOPMENT EFFORT TO PROVIDE ARNOLD ENGINEERING DEVELOPMENT CENTER WITH A LONG-RANGE ALIGNMENT MEASURING SYSTEM FOR THE HYPERVELOCITY TEST TRACK AT G-RANGE. THE ARRANGEMENT WILL INCLUDE AN AUTOMATED, LASER-BASED MAPPING SYSTEM THAT WILL INCORPORATE PARTS OF THE RECENTLY DEVELOPED LONG TUBE INSPECTION SYSTEM. IT WILL ALSO BE PROVIDED WITH A REMOTELY-CONTROLLABLE TRACK ALIGNMENT VEHICLE THAT WILL INTERFACE WITH A PORTABLE DISPLAY UNIT. A TRACK ALIGNMENT VEHICLE WILL ALLOW LOCAL ADJUSTMENT OF INDIVIDUAL TRACK HANGERS WITH DIRECT DIGITAL FEEDBACK. BY APPLYING ADVANCED, NEAR REAL-TIME IMAGE PROCESSING TECHNIQUES TO THE DETERMINATION OF LASER BEAM POSITION, FLOW EXPECTS TO EXTEND THE PRACTICAL DISTANCE LIMITATIONS INHERENT TO CONVENTIONAL LASER ALIGNMENT SYSTEMS. THE TECHNOLOGY DEVELOPED DURING THE PHASE II EFFORT HAS SIGNIFICANT POTENTIAL TO LEAD TO A PHASE III COMMERCIALIZATION PROGRAM.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: F49620-89-C-0018
MARK A DRUY
TITLE:
EXPERT SYSTEM CONTROL OF ORIENTATION IN ORDERED POLYMERS
FOR NLO APPLICATIONS
TOPIC# 241 OFFICE: AFOSR/XOT IDENT#: 16552

THE PHASE I PROGRAM WAS CONDUCTED BECAUSE THE APPLICATION OF

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ARTIFICIAL INTELLIGENCE TECHNIQUES TO THE COMPLEX PROBLEMS ASSOCIATED WITH THE PROCESSING OF LIQUID CRYSTALLINE POLYMERS WILL PROVIDE THE CONTROL NECESSARY TO EXPLOIT THE UNIQUE ENGINEERING AND OPTICAL PROPERTIES OF THESE MATERIALS. THESE MATERIALS ARE VERY DIFFICULT TO PROCESS INTO FINAL FORMS BECAUSE OF THEIR SENSITIVITY TO THE SHEAR HISTORY EXPERIENCED DURING PROCESSING. AT A MOLECULAR LEVEL THESE MATERIALS ARE ROD-LIKE IN CHARACTER. THE ALIGNMENT OF THESE ROD-LIKE MOLECULES IS SHEAR DEPENDENT, AND BOTH THE PHYSICAL AND NONLINEAR OPTICAL PROPERTIES ARE DEPENDENT UPON A HIGH DEGREE OF MOLECULAR ALIGNMENT BEING ATTAINED AND CONTROLLED. THE RESULTS OF THIS PROGRAM INCLUDED THE IDENTIFICATION OF THREE BANDS IN THE IN-FRARED WHICH WERE ORIENTATION DEPENDENT, IDENTIFICATION OF THE EXTRUSION VARIABLES WHICH CONTROL ORIENTATION, AND THE ABILITY TO UTILIZE THESE EXTRUSION VARIABLES TO CONTROL ORIENTATION. THE GOALS OF THE PHASE II PROGRAM ARE TO DEVELOP A PROCESS CONTROL FOR ORIENTATION AND TO IMPLEMENT AN EXPERT SYSTEM FOR PROCESSING OF ORDERED POLYMERS WITH IMPROVED NLO PROPERTIES.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: F29601-87-C-0041
WAYNE S HILL

TITLE:
DEFINITION OF TWO-PHASE FLOW BEHAVIORS FOR SPACECRAFT DESIGN
TOPIC# 200 OFFICE: AFWL/PRC IDENT#: 16617

THE LARGE POWER LEVELS OF FUTURE MILITARY SPACE STATIONS WILL REQUIRE PROPORTIONATELY LARGER RATES OF HEAT REJECTION. THE THERMAL MANAGEMENT SYSTEM THAT WILL BE USED TO REJECT THIS WASTE HEAT ALMOST CERTAINLY WILL EMPLOY TWO-PHASE FLOWS. HOWEVER, THE ADVANTAGES OF TWO-PHASE FLOWS CANNOT BE REALIZED WITHOUT AN UNDERSTANDING OF THEIR BEHAVIORS IN MICROGRAVITY. A RESEARCH SURVEY CONDUCTED IN THE PHASE I EFFORT DISCLOSED THAT, NOT ONLY WERE THE BEHAVIORS POORLY UNDERSTOOD, BUT THE LIMITS OF THE EFFECTS OF GRAVITY HAD NOT BEEN QUANTIFIED FOR MOST TWO-PHASE FLOW PHENOMENA. IN THE PROPOSED PHASE II PROGRAM, COMPLEMENTARY GROUND AND AIRPLANE TEST EFFORTS WILL BE CONDUCTED TO EXAMINE THE FLOW REGIMES, VOID FRACTIONS, AND PRESSURE DROPS OF ADIABATIC TWO-PHASE FLOWS IN MICROGRAVITY. THE

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GROUND TEST EFFORT WILL DETERMINE THE LIMITS OF THE EFFECTS OF GRAVITY, AND WILL EXAMINE THE BEHAVIORS FOR FLOW-CONDITIONS WHERE GRAVITY IS UNIMPORTANT. THE FLIGHT TEST EFFORT WILL VERIFY AND EXPAND ON THE RESULTS OF THE GROUND TESTING. CORRELATIONS WILL BE DEVELOPED DEFINING THE LIMITS OF THE EFFECTS OF GRAVITY AND PREDICTING THE BEHAVIORS OF ADIABATIC TWO-PHASE FLOWS IN MICROGRAVITY. THE PROPOSED PROGRAM ALSO WILL INCLUDE AN EFFORT TO IMPROVE THE COMMUNICATION OF RESULTS AND IDEAS BETWEEN RESEARCHERS. IN ADDITION, AN OPTIONAL TASK IS PROPOSED TO DETERMINE HOW THE AEROSPACE USER COMMUNITY CAN GAIN CONFIDENCE IN NEW MICROGRAVITY TWO-PHASE FLOW TECHNOLOGY, AND TO DEFINE THE CAPABILITIES, LIMITATIONS, AND COSTS OF IN-SPACE TESTING.

GEL-TECH INC
ONE PROGRESS BLVD - BOX 18
ALACHUA, FL 32615
CONTRACT NUMBER: F49620-89-C-0006
DR JEAN-LUC NOGUES

TITLE:

DEVELOPMENT OF A HIGH EFFICIENCY Q-SWITCHED GLASS LASER
VIA SOL-GEL AND PROCESSING

TOPIC# 241 OFFICE: AFOS/TXOT IDENT#: 16553

THE PHASE I RESEARCH DEMONSTRATED THE FEASIBILITY OF USING SOL-GEL PROCESSING TO PREPARE POTENTIAL LASER MATERIALS. THIS PHASE II PROPOSAL INCLUDES TECHNICAL OBJECTIVES AND A DETAILED WORK PLAN FOR OPTIMIZING THE PROCESS TO PREPARE SILICATE LASER GLASSES FOR EVENTUAL COMMERCIALIZATION. POTENTIAL ADVANTAGES FOR USING SOL-GEL PROCESSING ARE GIVEN.

GENERAL APPLIED SCIENCE LABS INC (GASL)
77 RAYNOR AVE
RONKONKOMA, NY 11779
CONTRACT NUMBER:
DR ROBERT G RAY

TITLE:

IMPROVED MANEUVERING REENTRY VEHICLE SIZING ANALYSIS

TOPIC# 229 OFFICE: BMO/MYSC IDENT#: 16781

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THE PRINCIPAL OBJECTIVES OF THE PHASE II EFFORT ARE (1) TO IMPROVE THE ROBUSTNESS AND DEPENDABILITY OF A COMPUTER CODE ORIGINALLY DEVELOPED BY AVCO SYSTEMS TEXTRON (NOW TDS) TO COMPUTE THE 3-D SHAPE CHANGE OF THE NOSETIP OF A MANEUVERING REENTRY VEHICLE AND (2) TO EXTEND THE CAPABILITY OF A COMPUTER CODE ALSO DEVELOPED BY TDS TO COMPUTE THE SHAPE CHANGE OF THE CONTROL FLAPS OF A MANEUVERING REENTRY VEHICLE. THERE ARE A NUMBER OF PROPOSED TASKS WHICH WILL CONTRIBUTE TO THE ROBUSTNESS AND DEPENDABILITY OF THE CODE. THE MAJOR EFFORT, HOWEVER, WILL CENTER ON DEVELOPING GRID TECHNIQUES TO CREATE AND MAINTAIN A GRID WELL ADAPTED FOR THE EVOLVING SHAPE OF THE NOSE TIP. THE FLAP SHAPE CHANGE CODE CURRENTLY ASSUMES THAT THE FORWARD FLOW IS OVER A SPHERICALLY BLUNTED NOSETIP AND THAT TRANSITION DOES NOT OCCUR ON THE FLAPS. THE CENTRAL TASKS HERE WILL BE TO MODIFY THE CODE SO THAT IT CAN ACCEPT NOSETIP SHAPES FROM THE NOSETIP CODE AND TO COMPUTE TRANSITION ON THE FLAP. SEVERAL OTHER TASKS WILL ALSO BE PROPOSED.

GENERAL SCIENCES INC
655 S GRAVERS RD
PLYMOUTH MEETING, PA 19462
CONTRACT NUMBER:
DONALD E NESTLER
TITLE:
JAMMER EXPULSION SUBSYSTEM DEVELOPMENT
TOPIC# 224 OFFICE: BMO/MYSC IDENT#: 16776

A STUDY IS PROPOSED TO CONTINUE DEVELOPMENT OF THE JAMMER EXPULSION SUBSYSTEM FOR THE DEFENSE SUPPRESSION JAMMER (DSJ) SYSTEM. THE OBJECTIVE OF THE PROPOSED STUDY IS TO (1) RESOLVE IDENTIFIED EXPULSION TECHNOLOGY ISSUES, (2) ADDRESS IDENTIFIED SUBSYSTEM DEVELOPMENT NEEDS, (3) DEVELOP A CREDIBLE EXPULSION SUBSYSTEM DESIGN, AND (4) DEMONSTRATE RELIABLE, REPEATABLE EXPULSION SUBSYSTEM PERFORMANCE. THIS WILL BE DONE BY PERFORMING DESIGN TRADEOFFS, ANALYSES, AND LABORATORY TESTS, FOLLOWED BY THE DESIGN, FABRICATION, AND TEST OF AN EXPULSION SUBSYSTEM PROTOTYPE UNIT.

GIGA-BIT LOGIC INC
1908 OAK TERRACE LN
NEWBURY PARK, CA 91320
CONTRACT NUMBER:
DR RICHARD EDEN
TITLE:
HARDENED 1750A CHIP SET
TOPIC# 212 OFFICE: BMO/MYSC IDENT#: 16761

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THIS PROPOSAL ADDRESSES THE NEED FOR A RADIATION HARD SEU TOLERANT MIL-STD-1750A CHIP SET FOR MISSILE AND SPACE APPLICATIONS. THE SEMICONDUCTOR TECHNOLOGY APPROACH IS TO UTILIZE THE RADIATION ATTRIBUTES OF GALLIUM ARSENIDE INTEGRATED CIRCUITS. NUCLEAR EFFECTS CAPABILITY OF GIGA-BIT LOGIC GaAs DEVICES ARE PRESENTLY UNDERGOING EVALUATION BY JACOR, (>100 MEGA-RAD TOTAL DOSE CAPABILITY IS ANTICIPATED). THE CHIP SET CONSTRUCTION APPROACH IS TO UTILIZE AS A CORE CHIP THE GaAs 1750A PRESENTLY UNDER DEVELOPMENT BY GALAXY MICROSYSTEMS UNDER AIR FORCE CONTRACT SPONSORSHIP (RADC). THIS IS A SINGLE CHIP IMPLEMENTATION OF THE INSTRUCTION SET ARCHITECTURE FOR A FULL-UP 1750A. THE CHIP ADDITIONALLY REQUIRED ROM AND RAM WHICH ARE AVAILABLE FROM GIGA-BIT GaAs AND A CACHE MEMORY CONTROLLER (CMC). THIS PROPOSAL COVERS IN PART THE DESIGN OF A CMC. THE CPU IS BEING IMPLEMENTED SO AS TO INCLUDE ERROR DETECTION AND CORRECTION (EDAC) CAPABILITY WHICH POTENTIALLY PROVIDES A 14 ORDER OF MAGNITUDE IMPROVEMENT TO SINGLE EVENT UPSETS (SEUs). THIS PROPOSAL COVERS IN PART THE IMPLEMENTATION OF GALAXY'S EDAC TECHNIQUES INTO THE CMC. TO EVALUATE THE APPLICATION OF THESE TECHNIQUES AND GaAs TECHNOLOGY, A TEST CHIP UNDER DEVELOPMENT BY GALAXY UNDER AIR FORCE SPONSORSHIP (RADC) WILL BE MADE AVAILABLE FOR PROCESSING AND NUCLEAR EFFECTS EVALUATION BY GIGA-BIT AND JAYCOR, RESPECTIVELY.

GLYNN SCIENTIFIC INC
73 FRANKLIN ST
ANNAPOLIS, MD 21401
CONTRACT NUMBER: 87-C-0341
THOMAS W GLYNN
TITLE:

LAW LOW COST TERMINAL SEEKER
TOPIC# 2 OFFICE: AD/XRX

IDENT#: 16534

IN PHASE I GSI DEVELOPED A CONCEPTUAL DESIGN FOR A LOW COST BOMB TERMINAL SEEKER. THIS WAS DONE VIA A TRADE STUDY COMPARING IR, VIDEO, LASER RADAR AND MMW DESIGNS. THE BEST PERFORMANCE FOR A REASONABLE COST WAS ATTAINED BY AN INNOVATIVE MMW DESIGN. IN PHASE II GSI PROPOSES TO FURTHER DEVELOP THE SELECTED "BEST" MMW DESIGN. THE PROGRAM WILL FABRICATE A PROTOTYPE MMW ELECTRONICALLY SCANNED ANTENNA AND WILL ALSO FABRICATE A MMW TRANSCEIVER, BOTH AT 94 GHz.

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IN ADDITION, A RADAR TEST BEST WILL BE USED TO COLLECT TOWER AND FLIGHT DATA. THIS DATA TOGETHER WITH AVAILABLE GOVERNMENT DATA WILL BE USED TO DEVELOP ADVANCE MULTIVARIATE STOCHASTIC DETECTION ALGORITHM. A NEW TRACKING ALGORITHM WILL ALSO BE DEVELOPED. OTHER TASKS WILL ADDRESS THE EFFECTS OF THE AERODYNAMIC DESIGN ON THE RADAR SYSTEM AD FORM CONSIDERATIONNS. THE RESULT OF THIS PROGRAM WILL BE A SEEKER DESIGN PROGRESSED TO THE POINT WHERE THE GOVERNMENT WILL HAVE A HIGH AMOUNT OF CONFIDENCE IN ITS ULTIMATE PERFORMANCE.

HUBB SYSTEMS INC
PO BOX 424
HUBBARDSTON, MA 01452
CONTRACT NUMBER: F19628-87-C-
STANLEY J POREDA
TITLE:
AUTONOMOUS-DISTRIBUTED SYNCHRONIZATION OF SPACE-BASED SYSTEMS
TOPIC# 36 OFFICE: ESD/XR IDENT#: 16544

FURTHER RESEARCH TO DEVELOP AND ESTABLISH THE FEASIBILITY OF AUTONOMOUS-DISTRIBUTED SYNCHRONIZATION (ADS) CONCEPTS FOR FUTURE MILITARY SPACE-BASED SYSTEMS IS PROPOSED. PHASE I RESEARCH LED TO THE DEVELOPMENT OF A SOPHISTICATED MODELING AND SIMULATION TOOL TO SUPPORT THIS WORK AND INITIAL OUTPUTS INDICATE THAT ADS SYSTEMS WILL BE ABLE TO MEET ANTICIPATED MILITARY SYNCHRONIZATION REQUIREMENTS USING INEXPENSIVE AND RELIABLE QUARTZ CLOCKS. FURTHER RESEARCH WILL CONCENTRATE ON IDENTIFYING PERFORMANCE DRIVERS AND ON DEVELOPING MORE SOPHISTICATED SYNCHRONIZATION PROCEDURES AND/OR ALGORITHMS.

HYPERSONICS INC
164 FERNE CT
PALO ALTO, CA 94306
CONTRACT NUMBER:
PAUL J CONTI
TITLE:
COMPUTATIONAL TOOL FOR ANTENNA WINDOW ABLATION
TOPIC# 240 OFFICE: BMO/MYSC IDENT#: 16791

CURRENT ANALYTICAL TOOLS USED IN THE DESIGN OF ANTENNA WINDOWS FOR

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REENTRY VEHICLES ARE LIMITED TO TWO SPACIAL DIMENSIONS, IN THE STREAMWISE AND IN-DEPTH DIRECTIONS, AND THEREFORE ARE UNABLE TO MODEL CORRECTLY THE EDGE EFFECTS THAT HAVE BEEN OBSERVED IN GROUND AND FLIGHT TESTS. THIS PROPOSAL ADDRESSES THE ADAPTATION OF ADVANCED COMPUTATIONAL FLUID DYNAMICS TECHNIQUES TO THREE-DIMENSIONAL ANTENNA WINDOW PROBLEM. THESE TECHNIQUES WILL BE USED TO PREDICT THE FLOWFIELD AROUND ABLATED ANTENNA WINDOWS, INCLUDING THE HEAT INPUT TO THE WINDOW, AND THE INTERACTION BETWEEN THE FLOWFIELD AND THE ABLATION PROCESS. THE ANALYTICAL TOOL WILL BE VALIDATED WITH WIND-TUNNEL TESTS SPECIFICALLY DESIGNED FOR THIS PURPOSE, AND WILL THEN BE APPLIED TO TYPICAL CONDITIONS ENCOUNTERED IN FLIGHT, TO CREATE A NUMERICAL DATA BASE FOR USE IN FUTURE ANTENNA WINDOW DESIGNS.

IAP RESEARCH INC
2763 CULVER AVE
DAYTON, OH 45429
CONTRACT NUMBER: 87-C-0111
DAVID P BAUER

TITLE:

EM GUN FOR LONG ROD PENETRATORS

TOPIC# 1 OFFICE: AFATL/SAS IDENT#: 16198

WE DEMONSTRATED THE FEASIBILITY OF LAUNCHING LONG ROD PROJECTILES IN PHASE I. THE LAUNCH PERFORMANCE INDICATED ELECTROMAGNETIC GUN TECHNOLOGY CAN SURPASS CONVENTIONAL GUN LIMITATIONS. IN PHASE II WE WILL DEVELOP AND DEMONSTRATE THE CAPABILITY TO LAUNCH FULL-SCALED HIGH ASPECT RATION AND LOW-STRENGTH PROJECTILES TO HYPERVELOCITY. THE PROGRAM WILL INCLUDE CONTINUED ANALYTICAL AND EXPERIMENTAL RESEARCH. THIS WILL RESULT IN THE LAUNCH OF PROJECTILES WITH AN ASPECT RATIO OF 40 AND A VELOCITY OF 2 km/s. PROJECTILES LAUNCHED UNDER THESE CONDITIONS ARE HIGHLY DESIRABLE AGAINST HEAVY ARMOR.

INDEPENDENT RISK ASSESSMENT INC
23141 PLAZA POINTE DR
LEGUNA HILLS, CA 92653
CONTRACT NUMBER:

FRANK J CHRISTY

TITLE:

INNOVATIVE TECHNOLOGIES/METHODOLOGIES TO REDUCE SPACE
SYSTEM COSTS

TOPIC# 167 OFFICE: AFSTC/OL-AB IDENT#: 16560

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THE EXPERIENCE OF THE PAST THIRTY YEARS IN THE SPACE BUSINESS HAS YET TO BE FULLY EXPLOITED FOR ITS POTENTIAL IN REDUCING SPACE SYSTEMS COSTS. THE PROPOSED PHASE II EFFORT WILL PROVIDE FOR THE COMPLETION OF THE DATA BASE AND MODEL STRUCTURE WHICH WAS JUST TOUCHED UPON IN THE PHASE I EFFORT. SPECIFICALLY, WE WILL LOOK AT COST REDUCTION AND COST AVOIDANCE INITIATIVES. WE WILL PROVIDE AN EXPANDED INQUIRY/STUDY INTO THE PRE-MILESTONE 0 PERIOD WHERE REQUIREMENTS ARE GENERATED AND DEFINED. THIS PHASE WILL BE EXAMINED INTO DEPTH TO ANALYZE THE ROLES OF BOTH GOVERNMENT AND INDUSTRY IN DEFINING REQUIREMENTS, ASSESSING TECHNOLOGY, AND MAKING COST PERFORMANCE TRADES. WE WILL LOOK AT THE PROCEDURES BEING USED AND MAKE RECOMMENDATIONS ON THE ADEQUACY OF THE POLICIES AND REGULATIONS GOVERNING THIS PROCESS. THE DECISION SUPPORT MODEL WILL BE AN EVOLUTION OF THAT DEVELOPED IN PHASE I AND WILL BE COMPATIBLE WITH EXISTING PERSONAL COMPUTERS. PHASE I STUDIES WILL BE EXAMINED IN GREATER DETAIL AND NEW STUDIES ADDED FOR DSP, MLV I AND II, DMSP, AND THE TITAN PROGRAM. COMMERCIAL PRACTICES WILL BE EXAMINED FOR APPLICABILITY. THE COST AND COST RISK OF PUTTING PAYLOADS IN SPACE WILL BE ANALYZED TO INCLUDE THE COST BALANCE BETWEEN BOOSTER AND PAYLOAD. AN INQUIRY WILL ALSO BE MADE INTO THE EMPHASIS PLACED ON PRODUCTIVITY AND DESIGNING PRODUCIBILITY, AFFORDABILITY AND SUPPORTABILITY INTO THE INITIAL DESIGN OF A PROGRAM.

INTEGRATED SOFTWARE INC
BOX 060295
PALM BAY, FL 32906
CONTRACT NUMBER: F33615-89-C-1004
DR SAMUEL S HARBAUGH
TITLE:
PROCESSOR FOR ARTIFICIAL INTELLIGENCE/ADA APPLICATIONS
TOPIC# 141 OFFICE: AFWAL/AA IDENT#: 16709

THE OBJECTIVE OF THE PROPOSED EFFORT IS TO PRODUCE AND DEMONSTRATE A 32 BIT AI/ADA PROCESSOR THAT IMPROVES THE PERFORMANCE OF REAL-TIME AVIONICS AI SOFTWARE IMPLEMENTED IN ADA. THE HARDWARE WILL DEMONSTRATE NEW CONCEPTS WHICH WILL LEAD TO DEVELOPMENT OF A 32 BIT AI/ADA MILITARIZED PROCESSING MODULE. PHASE I REVEALED THAT THERE ARE MANY PROBLEMS STANDING IN THE WAY OF USING AI TECHNIQUES IN

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REAL-TIME AVIONICS APPLICATIONS. THREE OF THE MOST SIGNIFICANT ARE GARBAGE COLLECTION, DYNAMIC MEMORY MANAGEMENT, AND DATA STRUCTURE HANDLING. DEFINING HARDWARE WHICH IMPLEMENTS THESE FUNCTIONS IS A FUNDAMENTAL STEP TOWARD DEVELOPING THE AI/ADA MILITARIZED PROCESSING MODULE. FOR PHASE II WE PROPOSE TO DEVELOP APPROACHES TO PROVIDING HARDWARE SOLUTIONS TO THE THREE PROBLEMS MENTIONED ABOVE. WE WILL PRODUCE SPECIFICATIONS AND ICD'S AND HARDWARE TO MEET THOSE SPECIFICATIONS. WE WILL THEN DEMONSTRATE THE PERFORMANCE IMPROVEMENTS WITH BENCHMARK AND DEMONSTRATION SOFTWARE. THE SOFTWARE WILL INCORPORATE AI TECHNIQUES AND BE WRITTEN IN ADA.

INTELLIGENT SYSTEMS INTEGRATION INC

3801 EUBANK NE - STE 201

ALBUQUERQUE, NM 87111

CONTRACT NUMBER: F49620-89-C-0013

DR TIMOTHY J ROSS

TITLE:

DEVELOPMENT OF A HIGH IMAGING-SPEED SCANNING ELECTRON
MICROSCOPE FOR DYNAMICALLY LOADED MATERIALS

TOPIC# 241 OFFICE: AFOST/XOT IDENT#: 16548

THE ABILITY TO MONITOR REAL-TIME MICROSTRUCTURAL DYNAMIC PROCESSES OF MATERIALS IN ENVIRONMENTS SUCH AS THERMAL SHOCK OR EXTERNAL IMPACT REQUIRES INSTRUMENTATION THAT CURRENTLY DOES NOT EXIST. SCANNING ELECTRON MICROSCOPY COULD HAVE THIS CAPABILITY IF SCANNING RATES WERE SUFFICIENTLY HIGH TO ILLUMINATE, MAGNIFY AND RECORD THE PROCESS AND IF THE SEM ITSELF COULD BE ISOLATED FROM THE DYNAMIC LOADS. THE OBJECTIVE OF THE PHASE II RESEARCH AND DEVELOPMENT EFFORT IN ADDRESSING THE SCIENTIFIC PROBLEM MENTIONED ABOVE WILL BE TO: DEVELOP A PROTOTYPE HIGH IMAGING-SPEED SCANNING ELECTRON MICROSCOPE (SEM) TO OBSERVE DYNAMIC EFFECTS ON THE MECHANICAL PROPERTIES OF SOLID MATERIALS AND DEMONSTRATE THE CAPABILITY AND USE OF THIS SEM WITH VERIFICATION TESTS ON MAGNIFICATION AND ILLUMINATION LEVELS AND ACTUAL LABORATORY TESTS ON DYNAMICALLY LOADED SOLID SPECIMENS INCLUDING BRITTLE MATERIALS. THERE ARE THREE MAIN TASKS TO BE ACCOMPLISHED TO ACHIEVE THE PHASE II OBJECTIVE AND SCIENTIFIC DESIGN GOALS FOR THE NECESSARY IMAGING AND RECORDING SPEEDS IN AN SEM REQUIRED FOR IMAGING DYNAMIC PROCESSES SUCH AS FRACTURE SCANS: (1) IMPULSE DEVICE AND SPECIMEN FIELD OF VIEW (REGION OF INTEREST), (2)

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PROTECT THE SEM FROM BRITTLE-FRACTURE DUST AND, (3) INCREASE SCANNING AND RECORDING RATES. THE PHASE II PLAN IS BASED ON A MODULARM CONCEPT OF THE SEM SYSTEM TO WHICH INCREMENTAL IMPROVEMENTS ARE MADE.

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER: 19628-87-C-0136
DR KENNETH ABEND
TITLE:
DISTRIBUTED ARRAY RADAR DEMONSTRATION
TOPIC# 40 OFFICE: RADC/XPX IDENT#: 16203

THE OBJECTIVE IS TO PERFORM A PROOF OF CONCEPT EXPERIMENT FOR DISPERSED, HIGHLY THINNED, PHASED ARRAY RADAR TO PROVE THAT A DISTRIBUTED ARRAY RADAR (DAR) CAN OPERATE COHERENTLY ON TRANSMIT AS WELL AS ON A RECEIVE, WITH FULL TWO-WAY GAIN. COHERENT OPERATION ON RECEIVE HAS ALREADY BEEN DEMONSTRATED OVER A TWELVE YEAR PERIOD USING A "RADAR CAMERA" TEST BED. THE DAR TEST BED TO BE INITIATED IN THIS PROGRAM WILL CONSIST OF DISTRIBUTED T/R MODULES AS OPPOSED TO THE DISTRIBUTED RECEIVERS AND SINGLE TRANSMITTER OF THE RADIO CAMERA. SINCE T/R COHERENCE IS NOT AS READILY ATTAINED RECEIVE-ONLY COHERENCE, NEW EQUIPMENT HAD TO BE DESIGNED IN ORDER TO ELIMINATE RISK. THE EXPERIMENT, EQUIPMENT, AND TEST LAYOUT WERE DEFINED IN PHASE I. THE EQUIPMENT WILL BE BUILT, THE EXPERIMENT WILL BE CANCELLATION. THE PROPOSED EXPERIMENTS REPRESENT THE CULMINATION OF PERFORMED, AND THE RESULTS WILL BE ANALYZED IN PHASE II. THIS NEW TEST BED CAN THEN BE EXPANDED IN LATER YEARS TO TEST OTHER METHODS FOR COHERING THE ARRAY AND METHODS FOR ALLEVIATING SIDELobe PROBLEMS. CLUTTER AND REDUCE CLUTTER DOPPLER SPREAD IN A SPACEBORNE OR AIRBORNE AIR DEFENSE RADAR.

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER: F04701-87-C-0112
DR KENNETH ABEND
TITLE:
SYNCHRONIZING AND COHERING A DISTRIBUTED ARRAY RADAR
TOPIC# 173 OFFICE: SD/SPO IDENT#: 16567

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THE OBJECTIVES ARE TO (1) VALIDATE THE TECHNICAL APPROACH FOR SYNCHRONIZING AND COHERING A SPACE BASED DISTRIBUTED ARRAY RADAR (DAR) THAT WILL DETECT LOW CROSS SECTION TARGETS IN SEVERE CLUTTER IN A COST EFFECTIVE MANNER, (2) DEFINE SYSTEM REQUIREMENTS AS A FUNCTION OF PERFORMANCE REQUIREMENTS, (3) EXTEND THE TECHNIQUES TO OPERATE IN AN ECM ENVIRONMENT, AND (4) DEVELOP A PLAN FOR GROUND, AIR, AND SPACE BASED TESTS AND DEMONSTRATIONS. THE EFFORT INVOLVES (1) DEVELOPING A QUANTITATIVE SYSTEM MODEL THAT INCLUDES A RADAR WAVEFORM DESIGN, A SELF SURVEY PROCEDURE, A DAR BASELINE CONFIGURATION, ALGORITHMS FOR SELF COHERING THE DAR ON THE BASIS OF CLUTTER RETURNS AND A TARGET DETECTION PROCEDURE THAT INCLUDES DOPPLER PROCESSING AND CLUTTER SUPPRESSION, (2) COMPUTER SIMULATIONS TO EVALUATE THE SELF COHERING ALGORITHMS AND THE ENTIRE DAR SYSTEM CONCEPT IN TERMS OF DETECTION PERFORMANCE, (3) DEVELOPMENT, SIMULATION, AND EVALUATION OF TECHNIQUES TO SELF COHERE THE DAR IN JAMMING, AND (4) DESIGN OF ADDITIONS TO A GROUND BASED DAR DEMONSTRATION TEST BED THAT ARE NEEDED FOR EXPERIMENTAL VALIDATION AND TESTING OF THE TECHNICAL APPROACH FOR SYNCHRONIZING AND COHERING THE DAR ON CLUTTER.

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER: F04701-87-C-0114
DR E HESHAM ATTIA

TITLE:
SIGNAL PROCESSING ARCHITECTURE FOR A DISTRIBUTED ARRAY RADAR
TOPIC# 177 OFFICE: SD/SPO IDENT#: 16575

WE PROPOSE TO FURTHER DEVELOP AN EFFICIENT SIGNAL PROCESSING ARCHITECTURE FOR THE DISTRIBUTED APERTURE RADAR (DAR) SYSTEM. DAR IS A SPACE-BASED, THINNED, PHASED ARRAY RADAR IN WHICH EACH ARRAY ELEMENT IS A SEPARATE SPACECRAFT (CALLED A MINI-RADAR). MINI-RADARS COOPERATE TO FORM SINGLE OR MULTIPLE COHERENT RADAR BEAMS. THE ARCHITECTURE DISTRIBUTES SIGNAL PROCESSING ALMOST EQUALLY THROUGHOUT THE MINI-RADAR CLUSTER AND ALLOWS FOR PROCESSING RECONFIGURATION IN THE EVENT OF A SINGLE (OR EVEN MULTIPLE) MINI-RADAR FAILURE, ECLIPSE, OR DESTRUCTION. THE FEASIBILITY OF THE EFFICIENT SIGNAL PROCESSING

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ARCHITECTURE WAS SHOWN IN THE PHASE I SBIR. THE PRIMARY OBJECTIVES OF THE PROPOSED EFFORT ARE: (1) TO MINIMIZE THE OVERALL COMPUTATIONAL REQUIREMENTS OF DAR, AND (2) TO DEVELOP A DETAILED DESIGN OF THE EFFICIENT ARCHITECTURE FOR THE SIGNAL PROCESSOR ONBOARD EACH SPACECRAFT THAT MEETS THE SYSTEM REQUIREMENTS. MINIMIZATION OF DAR COMPUTATIONAL REQUIREMENTS WILL BE ACHIEVED THROUGH (1) OPTIMIZATION OF THE DAR SYSTEM PARAMETERS, (2) ALGORITHMIC IMPROVEMENTS, AND (3) USING REDUCED PRECISION DIGITAL BEAMFORMING TECHNIQUES, I.E., QUANTIZING THE DATA AT THE MINI-RADAR LEVEL USING AS FEW A/D BITS AS POSSIBLE WITHOUT SIGNIFICANTLY DEGRADING SYSTEM PERFORMANCE. THE DETAILED DESIGN OF THE ARCHITECTURE OF THE ONBOARD PROCESSOR WILL ADDRESS THE ISSUES OF RECONFIGURABILITY, UPGRADABILITY, COMMUNICATION REQUIREMENTS, AND CHOICE OF THE APPROPRIATE TECHNOLOGIES (E.G., VLSI, VHSIC, ETC.).

IRVINE TECHNOLOGY GP INC
9 ST MAXIME
LAGUNA NIGUEL, CA 92677
CONTRACT NUMBER:
RONALD E OGLEVIE
TITLE:

AUTONOMOUS FLIGHT MANAGEMENT SYSTEM TECHNOLOGY FOR LOW-THRUST
UPPER STAGES

TOPIC# 172 OFFICE: SD/SPO IDENT#: 16566

THE PROJECT OBJECTIVE IS TO DEVELOP THE MOST NEEDED TECHNOLOGY (THOSE ISSUES WITH HIGHEST LEVELS OF RISK AND UNCERTAINTY) TO SUPPORT THE NEAR-TERM DEVELOPMENT OF A LOW-THRUST ORBITAL TRANSFER VEHICLE. THIS INCLUDES INVESTIGATION OF A BROADER RANGE OF EOTV MISSION APPLICATIONS, CONFIGURATION DESIGN, AND FURTHER DEVELOPMENT OF THE AUTONOMOUS FLIGHT MANAGEMENT SYSTEM CONCEPTS DEVELOPED IN PHASE I TO PROVIDE FLIGHT-READY TECHNOLOGY. THE PROPOSED EFFORT INCLUDES OPTIMIZATION OF MISSION AND EOTV DESIGN FOR BEST PERFORMANCE, DEVELOPMENT OF PRELIMINARY CONFIGURATION DESIGN CONCEPTS FOR REFERENCE AND DEMONSTRATION MISSIONS, DEVELOPMENT OF FLIGHT-TYPE AUTONOMOUS GUIDANCE ALGORITHMS, SUB-OPTIMAL STEERING TO REDUCE CONTROL AUTHORITY REQUIREMENTS, GUIDANCE ALGORITHMS FOR LOW-THRUST RENDEZVOUS, AND THE DEVELOPMENT AND DELIVERY OF FLIGHT SOFTWARE FOR CRITICAL AUTONOMOUS FLIGHT MANAGEMENT FUNCTIONS.

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KLEIN ASSOCS INC
PO BOX 264
YELLOW SPRINGS, OH 45387
CONTRACT NUMBER: F33615-89-C-5702
DR GARY A KLEIN
TITLE:
A CASE-BASED EXPERT SYSTEM FOR MANUFACTURING APPLICATIONS
TOPIC# 108 OFFICE: AFWAL/ML IDENT#: 16661

ONE OF THE KEY RESOURCES OF A MANUFACTURING COMPANY IS IT'S OWN HISTORY AND EXPERIENCE, KNOWLEDGE WHICH IS INVALUABLE FOR GUIDING PLANNING AND DECISION MAKING. MANY COMPLEX QUESTIONS CANNOT BE HANDLED ANALYTICALLY--THEY ARE BEST APPROCAHED BY SELECTING ANALOGUES FROM THE COMPANY'S HISTORY AND ADJUSTING THESE TO FIT NEW PROBLEMS. CASE-BASED REASONING IS AN EXPERT-SYSTEM APPROACH THAT IS WELL SUITED FOR MAKING EFFECTIVE APPLICATION OF A CORPORATE MANAGEMENT INFORMATION SYSTEM. THIS PROPOSAL IS TO BUILD A CASE-BASED REASONING SYSTEM AS AN INTELLIGENT INTERFACE TO A MANUFACTURING DATA BASE. WE WILL BE WORKING WITH A SMALL MANUFACTURING COMPANY THAT HAS SPENT 5 YEARS DEVELOPING A CASE-ORIENTED DATA BASE THAT ENABLES USERS TO WORK WITH EXACT MATCHES. THE CASE-BASED REASONING INTERFACE WILL PERMIT USERS TO GREATLY INCREASE THEIR RATE OF MATCHES BY IDENTIFYING SIMILAR CASES; THE INTERFACE WILL ALSO RECOMMEND ADJUSTMENTS SO THAT EARLY DECISIONS ABOUT HOW TO BID AND MANUFACTURE AN ITEM ARE DONE WITH A GREAT DEAL MORE ACCURACY AND EFFICIENCY. THE INTERFACE WILL SERVE AS A MODEL GENERIC CASE-BASED REASONING INTERFACE FOR MANUFACTURING DATA BASES.

KNOWLEDGE SYSTEMS CONCEPTS INC
262 LIBERTY PLAZA
ROME, NY 13440
CONTRACT NUMBER: 30602-87-C-0068
DR JOHN F LEMMER
TITLE:
APPLICATION OF MODERN MATHEMATICS TO THEATRE AIR WARFARE INTELLIGENCE
TOPIC# 64 OFFICE: RADC/XPX IDENT#: 16224

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THE OPPORTUNITY ADDRESSED HERE IS TO QUANTIFY THE UNCERTAINTY ASPECTS OF INDICATIONS & WARNING, SITUATION ASSESSMENT, AND PREDICTION, IN A UNIFORM AND CONCEPTUALLY SIMPLE, MATHEMATICAL MODEL WHICH ALSO SUPPORTS DECISION MAKING ASPECTS OF COLLECTION MANAGEMENT. THE MATHEMATICS NEATLY FIT THE CASUAL MODEL OF INTELLIGENCE. RECENTLY PROPOSED BY THE CIA AND IS BASED ON A STRAIGHTFORWARD GENERALIZATION OF BAYESAN INFERENCE. WHILE THE PHASE I WORK IMPLEMENTED A CAUSAL/PROBABILISTIC REASONING SYSTEM TO ESTIMATE ENEMY AIR COURSES OF ACTION FROM MULTI-ROLE UNITS, PHASE II RESEARCH WILL FOCUS ON PROVIDING POWERFUL BAYSEAN TECHNIQUES TO A WIDE RANGE OF USERS. THE THRUST OF PHASE II, THEN IS TO STUDY THE MMI REQUIREMENTS AND THE ASSOCIATED INFORMATION FLOW BETWEEN MODULES TO PROVIDE A ROBUST TOOL TO APPLY GENERALIZED BAYESAN TECHNIQUES TO REALISTIC THEATRE WARFARE INTELLIGENCE PROBLEMS.

KUIPERS & ASSOCS
3085 BAKER PARK DR SE
GRAND RAPIDS, MI 49508
CONTRACT NUMBER:
JACK KUIPERS

TITLE:
CHARACTERIZATION AND APPLICATION OF QUATERNIONS FOR ENHANCED
COMPUTER PROCESSING ALGORITHMS
TOPIC# 81 OFFICE: AMD/RDO IDENT#: 20062

THE QUATERNION OPERATOR HAS LONG BEEN REGARDED AS AN EFFICIENT ROTATION OPERATOR, BUT ONE THAT IS NOT WELL KNOWN IN THE PRACTICING AEROSPACE ENGINEERING COMMUNITY. SO, FIRST WE METRICIZE 'HOW MUCH BETTER' THE QUATERNION OPERATOR ACTUALLY IS COMPARED TO THE CONVENTIONAL ROTATION MATRIX FOR A VARIETY OF APPLICATIONS. THEN, QUATERNION ALGEBRA AND QUATERNION CALCULUS IS REGOROUSLY INTRODUCED AND DEVELOPED. THE INTRINSIC GEOMETRIC PROPERTIES OF THE QUATERNION OPERATOR ARE EXPLOITED IN ORDER TO ACHIEVE AN ENGAGING 'DO-IT-YOURSELF' PEDAGOGY. LIBERAL USE OF PICTORIAL REPRESENTATIONS OF THIS GEOMETRY AND ALSO OF THE VARIOUS APPLICATIONS WILL APPEAL TO THE INTUITION AND HENCE MAKE THE QUATERNION OPERATOR EASIER TO UNDERSTAND AND MORE READILY ACCESSIBLE TO ALL PRACTITIONERS.

LASERTRON INC
37 NORTH AVE
BURLINGTON, MA 01803
CONTRACT NUMBER: 19628-87-C-0154
R J PLASTOW

TITLE:
RELIABLE MICROWAVE LASER DIODE
TOPIC# 57 OFFICE: RADC/XPX IDENT#: 20483

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THE OBJECTIVE OF THIS PROGRAM IS TO DEVELOP A RELIABLE AND MANUFACTURABLE DESIGN OF A MICROWAVE MODULATED 20 GHZ FIBER OPTIC DIODE LASER SOURCE. THE OPPORTUNITY FOR RAPIDLY AND COST EFFECTIVELY ACHIEVING THIS OBJECTIVE ARISES FROM PRIOR DEVELOPMENT BY LASERTRON OF FIBER OPTIC DIODE LASER SOURCES FOR TELECOMMUNICATIONS. THESE TELECOMMUNICATIONS DEVICES INCLUDE THREE KEY TECHNOLOGIES REQUIRED BY THE 20 GHZ FIBER OPTIC SOURCE, NAMELY, A LASER CHIP CAPABLE OF 20 GHZ OPERATION, A LASER CHIP DESIGNED TO PROVIDE HIGH RELIABILITY AT HIGH CURRENT, AND A LASER WELDED FIBER-OPTIC PACKAGING TECHNOLOGY WHICH IS STABLE OVER TEMPERATURES TO 100 C. PHASE I RESULTS CONFIRM THE SUITABILITY OF THE APPROACH AND THE APPLICABILITY OF THE AVAILABLE TECHNOLOGIES FOR PRODUCING THE DESIRED 20 GHZ LASER. IN PHASE II LASERTRON PROPOSES TO UNDERTAKE THE FOLLOWING TASKS: 1) DESIGN AND CONSTRUCT A 20 GHZ FIBER OPTIC LASER PACKAGE CAPABLE OF MANUFACTURE IN VOLUMES WITH HIGH YIELD. 2) DEVELOP A NEW LASER MOUNTING METHOD WHICH IS STABLE UNDER THE HIGH CURRENT LEVELS TYPICAL OF OPERATION WITH BANDWIDTHS OF 20 GHZ. 3) INVESTIGATE THE USE OF DETUNED DFB LASERS TO OBTAIN >20 GHZ OPERATION. 4) DELIVER FIVE 20 GHZ LASER MODULES HAVING HIGH RELIABILITY.

LIGHT FANTASTIC INC
23 W MIDDLE LN
ROCKVILLE, MD 20850
CONTRACT NUMBER: F33615-88-C-1719
HERBERT INHABER
TITLE:
REAL-TIME HOLOGRAPHY COCKPIT DISPLAY
TOPIC# 149 OFFICE: AFWAL/AA IDENT#: 16719

THE "SUPER COCKPIT" CONCEPT, IN WHICH THE PILOT OF AN AEROSPACE VEHICLE BECOMES A MANAGER OF DATA RATHER THAN A PROCESSOR, WILL COMPLETELY TRANSFORM THE HANDLING AND DISPLAY OF IN-FLIGHT INFORMATION. AS PART OF THIS CONCEPT, HOLOGRAPHY MAY BE USED TO GIVE THE PILOT A TRUE THREE-DIMENSIONAL VIEW OF THE BATTLEFIELD SITUATION. IN PHASE I OF THIS PROJECT, IMPORTANT DISCOVERIES WERE MADE ON HOW TO ACHIEVE REAL-TIME AUTOSTEREOSCOPY VIEWING OF OBJECTS, USING HOLOGRAPHIC OPTICS. THESE DISCOVERIES, DEVELOPED INTO BENCH-SCALE

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SYSTEMS IN PHASE II, WILL, WE BELIEVE, ALLOW THE FIRST DEMONSTRATION EVER OF A IMPL REAL-TIME HOLOGRAPHIC DEVICE. THE SYSTEM HAS THE ADVANTAGE THAT IT IS ALL BASED ON COMMERCIALY AVAILABLE EQUIPMENT AND COMPONENTS, SUCH AS SPATIAL LIGHT MODULATORS. NO LENGTHY AND EXPENSIVE RESEARCH NEED BE PERFORMED TO DEVELOP NEW COMPONENTS OF THE SYSTEM WE PROPOSE. IN SUMMARY, THIS PROJECT SHOULD PRODUCE THE FIRST STEP TOWARD INSTALLING WORKING HOLOGRAPHIC SYSTEMS ON BOARD EXISTING AND FUTURE AIRCRAFT. THE OUTLINES OF THE LONG-AWAITED ROAD MAP FOR FLIGHT HOLOGRAPHIC APPLICATIONS IN THE 21ST CENTURY WILL, WE ARE CONVINCED, BECOME MUCH CLEARER.

LIGHTWAVE ELECTRONICS CORP
897-5A INDEPENDENCE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER: F19628-87C-0108
DR THOMAS J KANE
TITLE:
DIODE-PUMPED EYE-SAFE COHERENT LASER TRANSMITTER
TOPIC# 181 OFFICE: AFGL/XOP IDENT#: 16577

AN ALL-SOLID-STATE DIODE-PUMPED COHERENT LASER TRANSMITTER COULD BE BUILT WITH A PULSE ENERGY OF 10 mJ USING COMMERCIALY AVAILABLE LASER DIODES. WITH THIS ENERGY, DOPPLER VELOCIMETRY IS POSSIBLE AT A RANGE OF SEVERAL KILOMETERS. A MEASUREMENT OF WIND SPEED A FEW KILOMETERS AHEAD OF AN AIRCRAFT IN FLIGHT WOULD ALLOW A PILOT TO AVOID DANGEROUS WIND SHEAR. WE ARE PROPOSING TO DESIGN, BUILD AND SHIP TO THE AIR FORCE AN ALL-SOLID-STATE LASER TRANSMITTER WITH A PULSE ENERGY OF 10 mJ AND WITH ALL THE CHARACTERISTICS NEEDED FOR DOPPLER WIND VELOCITY MEASUREMENT. THIS TRANSMITTER WOULD BE EYE-SAFE AND WOULD HAVE AS ITS MOST EXPENSIVE COMPONENT ONE OR TWO 2.5 WATT LASER DIODES WHICH ARE COMMERCIALY AVAILABLE FOR \$15,000 EACH. GLOBAL WIND FIELDS COULD BE MEASURED FROM SATELLITES IF A TRANSMITTER WITH AN ENERGY OF 10 JOULES WERE AVAILABLE. WE PROPOSE TO DESIGN, BUT NOT BUILD, THE ENERGY-STORING COMPONENTS OF A 10 J DIODE-PUMPED LASER.

MDA ENGINEERING
PO BOX 120552
ARLINGTON, TX 76012
CONTRACT NUMBER: 87-C-0339
RALPH NOACK
TITLE:
INTERDISCIPLINARY APPLICATIONS OF DIGITAL SIMULATION-
COMPUTATIONAL FLUID DYNAMICS AND RADAR CROSS-SECTION
TOPIC# 1 OFFICE: AFATL/FXA IDENT#: 16192

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THE GOALS OF THIS PROGRAM INCLUDE THE IMPLEMENTATION OF NUMERICAL METHODS TO COMPUTE RADAR CROSS SECTION AND AERODYNAMIC CHARACTERISTICS OF FLIGHT VEHICLES USING COMMON GRID STRUCTURE AND NUMERICAL METHODS. NUMERICAL SOLUTION OF MAXWELL'S EQUATIONS CAN BE OBTAINED USING THE COMMON METHODS EMPLOYED IN COMPUTATIONAL FLUID DYNAMICS. IN THIS PROGRAM, RCS WILL BE CALCULATED USING THIS APPROACH FOR A VARIETY OF THREE-DIMENSIONAL CONFIGURATIONS AND AN EXTENSIVE EXPERIMENTAL VERIFICATION EFFORT IS INCLUDED. EXPERIMENTS AND NUMERICAL CALCULATIONS ARE PLANNED FOR BOTH SINGLE AND MULTIPLE FREQUENCY CASES.

MESILLA VALLEY HIGH-TECH INDUSTRIES INC

PO BOX 517

LAS CRUCES, NM 88005

CONTRACT NUMBER: F29601-87-C-0049

J PETE DREXLER

TITLE:

INTEGRATED CIRCUIT HIGH POWER MICROWAVE (HPM) HARDENING

TOPIC# 196 OFFICE: AFWL/PRC IDENT#: 20358

THE OBJECTIVE OF THIS PROJECT IS TO PRODUCE INTEGRATED CIRCUITS WHICH ARE HARDENED TO HIGH POWER MICROWAVE (HPM) RADIATION. PHASE I TESTS AND ANALYSIS INDICATED THAT THE PRIMARY FAILURE MODE OF ICs DURING HPM EXPOSURE IS A LOCALIZED JUNCTION BREAKDOWN AND A SUBSEQUENT THERMAL RUNAWAY. THE PHASE I ANALYSIS FURTHER INDICATED THAT THE PRIMARY CAUSE OF THE FAILURE IS HPM ENERGY ENTERING THE ICs ALONG THE LEADS AND THAT A SECONDARY CAUSE OF FAILURE IS HPM RADIATION PENETRATING THE IC POTTING MATERIAL AND BEING ABSORBED BY IC CHIP STRUCTURAL FEATURES. IT IS BELIEVED THAT THE MOST EFFECTIVE WAY TO SOLVE THIS PROBLEM IS TO SURROUND THE LEAD FRAME WITH AN RF ABSORBENT/REFLECTIVE MATERIAL AND TO COVER THE PACKAGE WITH A REFLECTIVE FILM. THE BULK OF THE EFFORT OF PHASE II WILL BE DIRECTED TOWARD IDENTIFYING THE BEST MATERIALS FOR RF REJECTION AND TOWARD THE DETERMINATION OF THE BEST MANUFACTURING PROCESS. HARDENED PARTS WILL BE PRODUCED AND TESTED FOR HPM HARDENING EFFECTIVENESS.

MICROCOSM INC

23720 ARLINGTON AVE - STE 5

TORRANCE, CA 90501

CONTRACT NUMBER:

FRANK TAI

TITLE:

NEAR-TERM ELECTRIC PROPULSION ORBIT TRANSFER VEHICLE (OTV)

TOPIC# 172 OFFICE: SD/SPO IDENT#: 16565

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MICROCOSM PROPOSES TO DEVELOP THE PRELIMINARY DESIGN FOR A NEAR-TERM DUAL THRUST ORBIT TRANSFER VEHICLE (OTV) FOR TRANSPORTING SPACECRAFT FROM LOW EARTH ORBIT TO HALF-GEOSYNCHRONOUS, GEOSYNCHRONOUS, OR OTHER HIGH-ENERGY ORBITS. THE OTV WILL BE BASED ON TECHNOLOGY AND SUB-SYSTEMS DERIVED FROM THE ORBITAL MANEUVERING VEHICLE (OMV). IT WILL USE HIGH EFFICIENCY ELECTRIC PROPULSION PLUS AUXILIARY LOW THRUST CHEMICAL PROPULSION TO PROVIDE BOTH MAXIMUM FLEXIBILITY AND LOW OPERATIONAL COST. PHASE II WILL ALSO PROVIDE THE DETAILED DESIGN FOR A SENSOR SYSTEM CAPABLE OF PROVIDING LOW COST AUTONOMOUS GUIDANCE FOR THE TRANSFER PROCESS TO MINIMIZE RISK AND GROUND OPERATIONS COSTS. TO MAXIMIZE USE OF CURRENT TECHNOLOGY AND ENSURE THE BEST POSSIBLE DESIGN, A TEAM HAS BEEN ASSEMBLED CONSISTING OF MICROCOSM, THE PHASE I CONTRACTOR AND A LEADING PROPONENT OF LOW THRUST TRANSFER; TRW, THE OMV PRIME CONTRACTOR; BARNES ENGINEERING, THE LEADING DESIGNER OF MICROPROCESSOR-BASED ATTITUDE SENSORS; AND CONSULTANTS WITH EXTENSIVE EXPERIENCE IN ELECTRIC PROPULSION AND TRANSFER VEHICLE SYSTEMS. THE RESULT OF PHASE II WILL BE A PRELIMINARY DESIGN FOR A NEAR-TERM OTV CAPABLE OF SUBSTANTIALLY REDUCING THE COST AND RISK OF ORBIT TRANSFER. A SIGNIFICANT COMMITMENT OF PHASE III FOLLOW-ON FUNDING HAS BEEN OBTAINED.

MISSION RESEARCH CORP
PO DRAWER 719 - 735 STATE ST
SANTA BARBARA, CA 93102
CONTRACT NUMBER: F33615-89-C-2175
DR GEORGE B CHAPMAN
TITLE:
AUTONOMOUS THREAT IDENTIFICATION AND RESPONSE USING THE
COUNTERMEASURE ASSOCIATION TECHNIQUE
TOPIC# 162 OFFICE: ASD/XR IDENT#: 16741

THE INTRODUCTION OF SOPHISTICATED ON-BOARD COMPUTERS HAS EXPANDED THE NUMBER OF OPERATING MODES A THREAT RADAR CAN EMPLOY, SOME OF WHICH ARE RESERVED STRICTLY FOR WARTIME USE. IT IS EXPECTED THAT THESE WARM THREAT SIGNATURES WILL BE NOTICABLY DIFFERENT FROM THE RADAR'S PEACETIME THREAT SIGNATURES. THE EFFECTIVENESS OF EW SYSTEMS WHICH RECOMMENDS COUNTERMEASURES BASED ON A MATCH BETWEEN OBSERVED THREAT SIGNATURES AND A PRIORI KNOWN PEACETIME SIGNATURES WILL BE

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DECREASED SUBSTANTIALLY. TO REMAIN VIABLE, AIRCRAFT NEED TO BE EQUIPPED WITH SYSTEMS CAPABLE OF PRODUCING EFFECTIVE COUNTERMEASURES AGAINST WARM OPERATING THREATS. IN PHASE I, MRC DEMONSTRATED A UNIQUE TECHNIQUE, THE COUNTERMEASURE ASSOCIATION TECHNIQUE (CMAT), WHICH WAS DESIGNED TO RECOMMEND EFFECTIVE COUNTERMEASURE AGAINST THREATS IN A WARM THREAT ENVIRONMENT. CMAT WAS DESIGNED TO HANDLE THREAT SITUATIONS WHEN DETECTED THREATS HAVE NOT BEEN IDENTIFIED BY INTEGRATING SUBJECTIVE AND OBJECTIVE THREAT INFORMATION USING FUZZY SET THEORY AND METHODS OF ARTIFICIAL INTELLIGENCE TO CHOOSE A SET OF COUNTERMEASURES ACCORDING TO THE ESTIMATED COUNTERMEASURE EFFECTIVENESS AGAINST THE DETECTED THREAT FEATURES. THE THREAT SIGNATURES INCLUDE THE STANDARD ELINT PARAMETERS AND IR AND/OR EO DISCRIMINATION DATA MADE AVAILABLE BY THE SENSOR SYSTEM. IN PHASE II, MCR WILL EXPAND THE DATABASE AND ENHANCE THE CAPABILITIES OF CMAT TO: a) BE CAPABLE OF RUNNING IN REAL TIME; b) SUCCESSFULLY RESPOND AGAINST MULTIPLE THREATS; c) CONSIDER THE PILOT'S MISSION OBJECTIVE AND ASSESSEMENT OF DATABASE UNCERTAINTY; AND d) CONSIDER THE AIRCRAFT'S RESOURCE CONSTRAINTS.

MISSION RESEARCH CORP
PO DRAWER 719
SANTA BARBARA, CA 93102
CONTRACT NUMBER:
DR STEVE F STONE
TITLE:
DUCT PROTECTION COATING CONCEPT DEVELOPMENT AND TEST
TOPIC# 27 OFFICE: AEDC/DOT IDENT#: 17457

THE DUCTS AT THE ARNOLD ENGINEERING DEVELOPMENT CENTER (AEDC) ARE USED TO CHANNEL TEMPERATURE-CONDITIONED AIR TO JET ENGINE TEST CELLS SO THAT THE ENGINES CAN BE CHARACTERIZED TO A WIDE RANGE OF OPERATING CONDITIONS. THE EXTREME ENVIRONMENTS PRESENT IN THE SYSTEM ARE CORRODING THE SURFACES OF THE LOW-CARBON STEEL DUCTS. THIS CORROSION POSES A SIGNIFICANT PROBLEM TO THE TESTING OF THE SOPHISTICATED JET ENGINES. OUR PHASE I PROGRAM INVESTIGATED THE POTENTIAL OF DEVELOPING COATINGS FOR THE DUCT SURFACES WHICH WOULD PREVENT FURTHER CORROSION AND WITHSTAND THE SEVERE OPERATING CONDITIONS. IN PHASE II WE PROPOSE TO DEVELOP AND TEST THESE COATING CONCEPTS. WE WILL FOCUS ON THREE SPECIFIC CONCEPTS - TWO

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PERMANENT AND ONE REPLENISHABLE - WHICH RESULTED FROM THE PHASE I EFFORT. THE PROPOSED EFFORT INVOLVES DEVELOPMENT, MODIFICATION, AND OPTIMIZATION OF THE COATING SYSTEMS; LABORATORY, SIMULATION, AND DUCT TEST PATCH TESTING; AND DEVELOPMENT OF SPECIFICATIONS AND PLANS FOR THE ACTUAL INSTALLATION OF THE COATING SYSTEM ON THE DUCT WALLS.

MOLTEN SALT TECHNOLOGY INC
1704 CLIFTGATE RD
KNOXVILLE, TN 37909
CONTRACT NUMBER: F33615-88-C-2912
GLEB MAMANTOV

TITLE:
DEVELOPMENT OF HIGH VOLTAGE RECHARGEABLE CELLS FOR AIRCRAFT AND MISSILE APPLICATIONS
TOPIC# 126 OFFICE: AFWAL/PO IDENT#: 16690

THE PROPOSED PHASE II EFFORT WILL INVOLVE INTENSIVE DEVELOPMENT OF A PRACTICAL HIGH VOLTAGE RECHARGEABLE CELL (Na/BETA"-ALUMINA/S(IV) IN MOLTEN $AlCl_3$ + NaCl) FOR AIRCRAFT AND MISSILE APPLICATIONS. THIS CELL HAS BEEN STUDIED EXTENSIVELY AT THE UNIVERSITY OF TENNESSEE SINCE 1976; IT HAS AN OPEN CIRCUIT VOLTAGE GREATER THAN 4.2 V AND A THEORETICAL ENERGY DENSITY OF 726 Wh/kg. THE FOLLOWING AREAS WILL BE STRESSED IN THE PHASE II PROGRAM: DETERMINATION OF THE OPTIMUM SEALING ARRANGEMENT TO BE USED IN THE PRACTICAL CELLS; MANUALLY BOLTED, DISC SPRING, AND BRAZED SEALS WILL BE EVALUATED. CONSTRUCTION AND EVALUATION OF PRACTICAL CELLS AND EXAMINATION OF THE FEASIBILITY OF BUILDING A BATTERY WHICH MEETS THE REQUIREMENTS OF THE PROPOSED APPLICATIONS.

MPD
2540 OLENTANGY RIVER RD
COLUMBUS, OH 43210
CONTRACT NUMBER: F33615-89-C-5606
J G KAUFMAN

TITLE:
AN INTELLIGENT KNOWLEDGE SYSTEM FOR SELECTION OF MATERIALS FOR CRITICAL AEROSPACE APPLICATIONS (IKSMAT)
TOPIC# 107 OFFICE: AFWAL/ML IDENT#: 16658

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THIS PROGRAM COVERS THE DETAILED RESEARCH, DEVELOPMENT, DESIGN AND CONSTRUCTION OF A FULLY OPERATIONAL PROTOTYPE COMPUTERIZED INTELLIGENT KNOWLEDGE SYSTEM FOR THE SCREENING AND SELECTION OF MATERIALS FOR SPECIFIC CRITICAL AEROSPACE COMPONENTS (IKSMAT). THE PROTOTYPE WILL DEAL WITH WINGSPARS AND UPPER AND LOWER WINGSKINS, AND WILL BE READILY EXPANDABLE TO HANDLE A WIDE VARIETY OF APPLICATIONS. THE IKSMAT SYSTEM PROVIDES EASY-TO-USE MULTIPLE PATH ACCESS TO A KNOWLEDGE BASE VITAL TO THE ASSESSMENT OF THE SUITABILITY OF MATERIALS BASED UPON THE EVALUATION OF SPECIFIC PROPERTIES AND DESIGN-RELATED PARAMETERS. USERS WILL BE ABLE TO UTILIZE THE EXPERT KNOWLEDGE PROGRAMMED INTO THE SYSTEM, ADD NEW MATERIALS AND/OR PROPERTIES, OR ALTER THE PERFORMANCE CRITERIA AND THEIR PRIORITIES TO CARRY OUT SPECIALIZED SEARCHES. THE SYSTEM IS DESIGNED TO HANDLE THE FULL BREADTH OF TECHNICAL TERMINOLOGY AND NOMENCLATURE, AND THE SPECIAL REQUIREMENTS OF KEY SPECIFICATIONS AND DESIGN HANDBOOKS.

MSNW INC
PO BOX 865
SAN MARCOS, CA 92069
CONTRACT NUMBER: F33615-87-C-5274
DR GEORGE H REYNOLDS
TITLE:
CHEMICAL VAPOR SYNTHESIS OF NIOBIUM ALUMINIDES
TOPIC# 105 OFFICE: AFWAL/ML IDENT#: 16655

THE PROPOSED PHASE II RESEARCH WILL OPTIMIZE THE DEPOSITION PROCESS FOR Nb-Al INTERMETALLIC FOILS. THE APPARATUS USED FOR CHEMICAL VAPOR DEPOSITION WILL BE MODIFIED TO INCREASE THE PRODUCE DEPOSITION RATE. ALTERNATIVE PRECURSOR SPECIES WILL BE EXAMINED IN AN ATTEMPT TO REDUCE FOIL RESIDUAL GAS CONTENTS. THE INVESTIGATION WILL BE EXTENDED TO INCLUDE DETAILED EXAMINATIONS OF THE Nb-Si SYSTEM, SELECTED ADVANCED INTERMETALLICS SUCH AS V3Si, AND Cr3Si, AND THE DIRECT DEPOSITION OF DISPERSION-TOUGHENED INTERMETALLIC FOILS CONTAINING FINE, THERMOCHEMICALLY STABLE METALLIC SECOND PHASES. ALL PROCESS AND MATERIAL DEVELOPMENT EFFECTS WILL BE SUPPORTED BY THERMOCHEMICAL MODELING OF THE DEPOSITION REACTIONS. CHARACTERIZATION TECHNIQUES WILL INCLUDE DETAILED MICROSTRUCTURE, MICROCHEMICAL AND PHASE IDENTITY EXAMINATIONS AND DIRECT MECHANICAL PROPERTY

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MEASUREMENTS ON PRODUCT INTERMETALLIC FOILS. CHEMICAL VAPOR
INFILTRATION OF SELECTED MATRICES INTO THERMOCHEMICALLY COMPATIBLE
CERAMIC FIBER PREFORMS WILL BE DEMONSTRATED.

MSNW INC
PO BOX 865
SAN MARCOS, CA 92069
CONTRACT NUMBER: FY1457-89-G-1005
DR GEORGE H REYNOLDS
TITLE:
LASER PROBE VAPORIZATION/OXIDATION TESTING OF HIGH TEMPERATURE
COMPOSITES
TOPIC# 105 OFFICE: AFWAL/ML IDENT#: 16656

*THIS PROJECT WILL USE HIGHLY INSTRUMENTED MICROSCALE LASER TEST
FACILITIES FOR REAL-TIME MEASUREMENT OF VAPORIZATION/OXIDATION PHENO-
MENA AT TEMPERATURES UP TO 4000 DEG F. THE TECHNIQUE WILL BE APPLIED
TO FOUR MODEL COMPOSITE SYSTEMS, TWO OXIDATION-RESISTANT CARBON-
CARBON COMPOSITE SYSTEMS AND TWO OXIDATION-RESISTANT CERAMIC MATRIX
COMPOSITE SYSTEMS. THE MICROSTRUCTURE OF EACH MATERIAL WILL BE
CHARACTERIZED IN DETAIL BOTH BEFORE AND AFTER LASER TESTING. MICRO-
SCALE TESTING WILL BE PERFORMED USING LOCAL AREA HEATING OF TEST
SPECIMENS IN VACUUM TO STUDY VAPORIZATION PHENOMENA AND IN BOTH LOW
OXYGEN PARTIAL PRESSURES AND AIR TO STUDY OXIDATION PRODUCT SPECIES
AND COMBINED OXIDATION/VAPORIZATION REACTION PHENOMENA. ON-LINE LASER
PROBE SPECTROMETRY WILL BE USED TO PROVIDE REAL-TIME DETERMINATION OF
CHEMICAL SPECIES PRESENT AT TEMPERATURE IN THE NEAR-SURFACE ENVIRON-
MENT. THE OBSERVED PHENOMENA WILL CORRELATE WITH MICROSTRUCTURAL
AND MICROCHEMICAL CHANGES DISCERNED FROM PRE- AND POST-TEST
CHARACTERIZATION OF THE MODEL MATERIALS. THEORETICAL MODELING OF
THERMOCHEMICAL PROCESSES EXPECTED TO OCCUR AT THESE TEMPERATURES WILL
BE COMPARED TO OBSERVED VAPORIZATION/OXIDATION SPECIES. THE DEVELOPED
TEST METHOD SHOULD BE USEFUL AS A MATERIALS DEVELOPMENT AND SCREENING
TOOL AND MAY ALSO BE USEFUL FOR PREDICTION OF LONG-TERM HOT CORROSION
BEHAVIOR FROM KNOWLEDGE OF THE BASIC REACTION INVOLVED. THE PROJECT
WILL BE PERFORMED WITH THE TECHNICAL ASSISTANCE OF A CONSORTIUM OF
ANTROPIX CORPORATION/HOUSTON AREA RESEARCH CENTER/RICE UNIVERSITY AS
SUBCONTRACTOR.

NORTHWEST RESEARCH ASSOCS INC
PO BOX 3027
BELLEVUE, WA 98027
CONTRACT NUMBER:
R DAVID LUCAS
TITLE:
INTERACTIVE VISUALIZATION OF COMPLEX VOLUMETRIC DATA
TOPIC# 190 OFFICE: BMO/MYSC IDENT#: 40253

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OUR PHASE-I RESULTS DEMONSTRATE THE FEASIBILITY OF INTERACTIVE VISUALIZATION OF MULTIDIMENSIONAL DATA REPRESENTING FIELDS IN THREE OR MORE DIMENSIONS. OUR APPROACH IS BASED ON LOW-COST WORKSTATION HARDWARE ENHANCED WITH SUITABLE MEMORY AND WRITE-ONCE OPTICAL STORAGE. THE PHASE-II PROJECT WILL FOCUS ON DATA DEFINED ON CURVILINEAR (E.G., CYLINDRICAL) COORDINATES AND FINITE-ELEMENT REPRESENTATIONS. CAPABILITIES FOR INTERACTIVE PERUSAL OF EXTENDED MULTICHANNEL TIME-SERIES DATA WILL ALSO BE DEVELOPED. A VISUALIZATION SYSTEM INCLUDING TWO WORKSTATIONS, OPTICAL STORAGE, GRAPHICS HARDCOPY DEVICES, AND SOFTWARE WILL BE DEVELOPED AND INSTALLED AT A SPECIFIC AIR FORCE SITE. THIS SYSTEM WILL PROVIDE COMPREHENSIVE VISUALIZATION CAPABILITIES FOR THE ANALYSIS AND INTERPRETATION OF DATA TYPES IN USE AT THAT SITE. INCLUDED WILL BE INTERACTIVE DISPLAYS OF VOLUME DATA REPRESENTING FLUID FLOWS INTERACTING WITH ABLATING SURFACES, CONTOUR AND COLOR MAPS REPRESENTING 2D FIELDS, AND LINE DISPLAYS REPRESENTING FINITE-ELEMENT AND TIME-SERIES DATA.

OPTRA INC
83 PINE ST
PEABODY, MA 01960
CONTRACT NUMBER: F19628-87C-0111
GEERT J WYNTJES

TITLE:

A VERSATILE RAPID SCAN MICHELSON INTERFEROMETER FOR THE UV
TOPIC# 184 OFFICE: AFGL/XOP IDENT#: 16581

OPTRA HAS DEMONSTRATED UNDER THE PHASE I EFFORT THAT A 2-FREQUENCY HeNe LASER BASED METROLOGY SYSTEM CAN BE USED WITH A MICHELSON INTERFEROMETER TO BRING THE SYSTEM INTO INITIAL ALIGNMENT AND TO MAINTAIN THAT ALIGNMENT WITH THE REQUISITE PRECISION TO BE HIGHLY EFFICIENT IN THE UV AND EVEN THE VACUUM UV. THE ADVANTAGES OF HIGH THROUGHPUT, A MULTIPLEX ADVANTAGE THAT IS STILL SUBSTANTIAL, AND THE PRECISE AND STABLE INSTRUMENTAL PROFILE AND WAVELENGTH SCALE OF THE FOURIER TRANSFORM SPECTROMETER (FTS) CAN NOW BE REALIZED IN THIS REGION USING THE EFFICIENT RAPID SCAN MICHELSON DESIGN. THE ADVANTAGE OF THIS DESIGN INCLUDES COMPACTNESS, A HIGH SCAN EFFICIENCY, AND A HIGH OPTICAL EFFICIENCY MADE POSSIBLE BY THE SMALL

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NUMER OF OPTICAL ELEMENTS. THE SPECIFIC EFFORT PROPOSED HERE IS TO INCORPORATE THE DEMONSTRATED CAPABILITIES INTO A COMPACT FIELDABLE INTERFEROMETER SUITABLE FOR A NUMBER OF EXISTING AND CONTEMPLATED AIR FORCE MISSIONS IN SUPPORT OF THE AIR FORCE AERONOMY PROGRAM.

ORD INC
238 BROADWAY
CAMBRIDGE, MA 02139
CONTRACT NUMBER:
MYRON J BLOCK
TITLE:
INEXPENSIVE DISPOSAL PAPER BADGE DOSIMETER FOR NERVE AGENT
TOPIC# 79 OFFICE: AMD/RDO IDENT#: 20064

WE PROPOSE TO DEVELOP A SYSTEM CONSISTING OF A SMALL, CHEAP, DISPOSABLE DOSIMETER BADGE, AND AN INEXPENSIVE PORTABLE FLUORIMETER TO BE USED TOGETHER FOR DETECTION OF NERVE AGENT IN THE FIELD. THE DETECTION IS BASED ON ACETYLCHOLINESTERASE INHIBITION GIVING THE SYSTEM HIGH FUNCTIONAL SPECIFICITY. ALSO, OUR SEPARATION OF DETECTION INTO TWO STEPS ELIMINATES FLOW OR MIXING OF REAGENTS AND ENABLES US TO INCORPORATE A REFERENCE TO COMPENSATE FOR REAGENT AND BADGE VARIATIONS. OTHER ADVANTAGES OF OUR METHOD OVER EXISTING TECHNIQUES ARE: 1. OUR INDICATOR IS FLUORESCENT RATHER THAN COLORIMETRIC BECAUSE FLUORIMETRY IS INHERENTLY MORE SENSITIVE THAN COLORIMETRY. THE PROJECTED SENSITIVITY OF OUR INTEGRATING BADGE MEETS THE ARMY'S SENSITIVITY GOAL (10(-5) mg/m(3)) IN ONLY ONE SECOND OF INTEGRATION TIME AND SENSITIVITY INCREASES LINEARLY WITH TIME. 2. OUR USE OF AN INEXPENSIVE DISPOSABLE BADGE ALLOWS WIDESPREAD UN-ATTENDED USE (E.G. ON PERIMETERS). 3. OUR READOUT REQUIRES NO SUBJECTIVE INTERPRETATION AS DO MANY COLORIMETRIC TESTS. THE PHASE II EFFORT WILL INCLUDE: SYNTHESIS OF SUBSTRATE 1-METHYL-7-ACETOXY-QUINOLINIUM IODIDE, CONSTRUCTION OF CONSUMABLE PROTOTYPE BADGE READOUT CHAMBER, DEMONSTRATION OF BADGE/READOUT CHAMBER WITH SIMULANT AND THE DESIGN AND CONSTRUCTION OF AN INEXPENSIVE FIELDABLE FLUORIMETER.

ORTEL CORP
2015 W CHESTNUT ST
ALHAMBRA, CA 91803
CONTRACT NUMBER: 19628-87-C-152
DR KAM LAU
TITLE:
OPTICAL TO MICROWAVE LASER DIODE SOURCE
TOPIC# 46 OFFICE: RADC/XPX IDENT#: 16208

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THE TECHNICAL OBJECTIVES OF PHASE II OF THIS CONTRACT TO PRODUCE ARE: (1) A MONOLITHIC LASER DIODE DEVICE CAPABLE OF SELF-GENERATION OF OPTICAL MODULATION AT NEAR 100% MODULATION DEPTH, AT FREQUENCIES APPROACHING 100 GHz AS DETERMINED BY THE LENGTH OF THE LASER CAVITY, (2) THE OUTPUT OF SUCH A DEVICE CAN BE PHASE LOCKED BY AN EXTERNALLY INJECTED SIGNAL OVER A CERTAIN BANDWIDTH AROUND SELF-OSCILLATION FREQUENCY, AND (3) THE OPTICAL OUTPUT OF THE DEVICE CAN BE SWITCHED ON OR OFF WITH SUB-NANOSECOND TIME SCALE. AN ADDITIONAL OBJECTIVE OF PHASE II IS TO OBTAIN SHORT OPTICAL PULSES FROM A SOLITARY LASER DIODE WITH PULSE WIDTH BELOW 10 ps BY THE METHOD OF GAIN SWITCHING.

PDA ENGINEERING
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
JAMES L DELEGET

TITLE:

WIND TUNNEL SHEAR STRESS GAGE DEVELOPMENT

TOPIC# 232 OFFICE: BMO/MYSC IDENT#: 21125

THE OBJECTIVE OF THIS PROGRAM IS TO HELP AEDC EXTEND ITS HOT-FILM TRANSDUCER GAGE CAPABILITY TO THE MEASUREMENT OF WALL SHEAR STRESS IN CONTINUOUS WIND TUNNEL ENVIRONMENTS. THE PROPOSED PROGRAM CONSISTS OF (1) TRANSDUCER FABRICATION AND SCREENING TESTS, AND (2) HOT-FILM TRANSDUCER CALIBRATION TASKS USING AEDC'S EXISTING SPINNING CONCENTRIC-CYLINDER APPARATUS. THE DURABILITY/SURVIVABILITY OF THE OPTIMIZED HOT-FILM TRANSDUCER CONCEPT AND THE VALIDITY OF THE BENCH TOP CALIBRATION WILL BE DEMONSTRATED IN AEDC WIND TUNNEL TEST ENVIRONMENTS.

PHASEX CORP
287 EMERSON RD
LEXINGTON, MA 02173
CONTRACT NUMBER: 87-C-0346
VAL KRUKONIS

TITLE:

EXPLORATORY DEVELOPMENT ON A NEW NITROGUANIDINE
RECRYSTALLIZATION PROCESS

TOPIC# 6 OFFICE: AFATL/MNE IDENT#: 16513

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THE CURRENT NITROGUANIDINE (NQ) MANUFACTURING PROCESS AT SUNFLOWER ARMY AMMUNITION PLANT, DESOTO, KS, PRODUCES NEEDLE SHAPED PARTICLES WHICH, BECAUSE OF THEIR LOW BULK DENSITY, ARE NOT SATISFACTORY FOR HIGH SOLIDS CONTENT EXPLOSIVE FORMULATIONS; 100 MICRON AND 500 MICRON DENSE SPHERICAL PARTICLES ARE DESIRED. ON THE PHASE I PROGRAM THE CONCEPT OF SUPERCRITICAL FLUID OR GAS ANTI-SOLVENT RECRYSTALLIZATION WAS INVESTIGATED; AN APPROPRIATE GAS (FOR THE PARTICULAR SOLVENT SYSTEM) DISSOLVES IN A SOLUTION OF NQ, LOWERS THE DISSOLVING POWER OF THE SOLVENT FOR NQ, AND PARTICLES CRYSTALLIZED. DEPENDING UPON EXPERIMENTAL PARAMETERS VARIOUS SIZES, SHAPES, AND SIZE DISTRIBUTIONS OF NQ COULD BE FORMED, AND BY THE END OF THE PHASE I PROGRAM 100 MICRON, PARTIALLY DENSE SPHERES WERE PRODUCED. THE OBJECTIVES OF THE PHASE II PROGRAM ARE: 1. OPTIMIZE THE PROCESS TO PRODUCE FULLY DENSE 100 MICRON SPHERES OF NQ, 2. PRODUCE 100 LBS OF IMPROVED NQ FOR EVALUATION, 3. REFINES THE PROCESS FLOW CHART AND CARRY OUT A DETAILED COST EVALUATION OF THE PROCESS.

PHYSICAL SCIENCES INC
PO BOX 3100 - RESEARCH PK
ANDOVER, MA 01810
CONTRACT NUMBER: F33615-88-C-2907
DR TERENCE E PARKER
TITLE:
OPTICAL DIAGNOSTICS FOR SUPERSONIC REACTING FLOWS
TOPIC# 134 OFFICE: AFWAL/PO IDENT#: 16700

AN EXPERIMENTAL INVESTIGATION THAT WOULD IMPLEMENT SEVERAL NON-INTRUSIVE OPTICAL DIAGNOSTIC OF A SUPERSONIC HIGH TEMPERATURE FLOW IS PROPOSED. THE FLOW WOULD BE PRODUCED IN A MACH ... SHOCK TUNNEL; TEMPERATURES AND PRESSURES WOULD RANGE FROM 500 TO 1500 K AND 0.1 TO 3.0 ATMOSPHERES. THE PRIMARY DIAGNOSTICS FOR THIS REACTING FLOW WOULD BE PLANAR LASER-INDUCED FLUORESCENCE (PLIF) OF OH, ABSORPTION MEASUREMENTS OF OH AND NO, AND OPTICALLY-BASED TEMPERATURE MEASUREMENTS OF THE PRE- AND POST-COMBUSTION FLOW. THE PLIF MEASUREMENT WOULD PRODUCE AN INSTANTANEOUS TWO DIMENSIONAL REPRESENTATION OF THE OH SPECIES CONCENTRATION IN A PLANE AND THEREFORE IDENTIFY ZONES OF CHEMICAL ACTIVITY FOR THE FLOW. ABSORPTION MEASUREMENTS OF OH AND NO WOULD PROVIDE A TIME HISTORY OF THE

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SPECIES CONCENTRATION ALONG A LINE-OF-SIGHT. THE PLIF OH MEASUREMENT, OH AND NO MEASUREMENT, AND TEMPERATURE MEASUREMENT WOULD BE SUFFICIENTLY DEVELOPED BY THE CONCLUSION OF THE PHASE II PROGRAM THAT THEIR APPLICATION AT OTHER HIGH ENTHALPY FLOW FACILITIES WOULD BE STRAIGHTFORWARD. IN ADDITION TO THE PREVIOUSLY LISTED MEASUREMENTS, A SECOND GROUP OF DIAGNOSTICS HAS BEEN IDENTIFIED THAT WOULD BE INVESTIGATED DURING THE PHASE II PROGRAM. THEY INCLUDE PLIF OF NO, EMISSION MEASUREMENTS OF H₂O, LASER-INDUCED FLUORESCENCE OF ATOMIC HYDROGEN AND OXYGEN, A DENSITY FLUCTUATION DIAGNOSTIC, AND A VELOCITY MEASUREMENT BASED ON MOLECULAR SEED SPECIES.

PINNACLE RESEARCH INSTITUTE INC
10432 N TANTAU AVE
CUPERTINO, CA 95014
CONTRACT NUMBER: 87-C-0329
DR GARY BULLARD

TITLE:

EXTENDED TEMPERATURE RANGE ULTRACAPACITOR

TOPIC# 13 OFFICE: AFATL/MNF IDENT#: 16526

THE PROPOSED DEVELOPMENT PROGRAM SEEKS TO ESTABLISH THE TECHNOLOGY REQUIRED FOR FABRICATION OF AN EXTENDED TEMPERATURE RANGE, HIGH ENERGY DENSITY, ULTRACAPACITOR. THE MAJOR FOCUS OF THE PROGRAM IS ON EXTENDING THE LOW TEMPERATURE OPERATING RANGE TO <-50 DEG C. CONTINUATION OF WORK INITIATED IN PHASE I IS PROPOSED FOR THREE DIFFERENT ELECTROLYTE SYSTEMS, EACH OF WHICH EXHIBITS POTENTIAL BENEFITS FOR THIS APPLICATION. BASED ON EXPERIMENTAL RESULTS GENERATED DURING THIS PHASE II PROGRAM, ONE ELECTROLYTE SYSTEM WILL BE SELECTED FOR DEVELOPMENT AND DEMONSTRATION OF PROTOTYPE UNITS IN THE 5-10V RANGE.

POTOMAC PHOTONICS INC
UNIVERSITY OF MARYLAND - BLDG 335
COLLEGE PARK, MD 20742
CONTRACT NUMBER: F49620-88-C-0092
C PAUL CHRISTENSEN

TITLE:

QUASI-CW EXCIMER LASER

TOPIC# 241 OFFICE: AFOST/XOT IDENT#: 16558

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DEVELOPMENT OF A NEW QUASI-CW WAVEGUIDE EXCIMER LASER IS PROPOSED. THE PROPOSED DEVICE WOULD BE A COMPACT SELF-CONTAINED SOURCE OF PULSED ULTRAVIOLET RADIATION AT WAVELENGTHS OF 308 nm, 249 nm, AND 193 nm. PULSE REPETITION RATE EXCEEDING 100 kHz AND PULSE DURATIONN GREATER THAN 200 ns WILL PROVIDE OPTICAL DUTY FACTORS OF SEVERAL PERCENT. ADVANCED METHODS FOR FABRICATION OF THE LASER DISCHARGE TUBE WILL BE INVESTIGATED WITH THE GOAL OF ACHIEVING LOW OPTICAL LOSS AND SEALED-OFF OPERATION. THE LASER WILL BE EXCITED BY A SOLID STATE MICROWAVE SOURCE AND UTILIZE A COMPACT POWER SUPPLY OF ADVANCED DESIGN.

QUALCOMM INC
10555 SORRENTO VALLEY RD
SAN DIEGO, CA 92121
CONTRACT NUMBER: F19628-87-C-0175
ANDREW R COHEN
TITLE:
DEMONSTRATION OF MANPACK SATELLITE COMMUNICATIONS
TOPIC# 36 OFFICE: ESD/XR IDENT#: 16543

PHASE I STUDIED THE PROBLEM OF HOW TO PROVIDE X-BAND COMMUNICATIONS BETWEEN A SMALL, MANPACK SIZED AND SMALL, MOBILE TERMINALS AND A LARGE HUB TERMINAL. IT BECAME EVIDENT FROM THE LINK BUDGETS THAT SUCH FUNCTIONALITY IS ENTIRELY FEASIBLE AT DATA RATES UP TO 2400 BPS. WE PROPOSE HERE A DEMONSTRATION PROGRAM WHICH IS BASED ON AN EXISTING Ku-BAND TWO-WAY COMMUNICATION SYSTEM, CALLED OMNI-TRACS(TM), WHICH IS CURRENTLY OPERATING OVER COMMERCIAL Ku-BAND SATELLITE TRANSPONDERS. OUR APPROACH TO THE X-BAND DEMONSTRATION SYSTEM IS TO USE THE IF AND BASEBAND PORTIONS OF OMNI-TRACS(TM), WHICH INCLUDES ALL OF THE CRITICAL SIGNAL PROCESSING FUNCTIONS, AND TO PROVIDE A MODIFIED FRONT END AND ANTENNA TO INTERFACE WITH THE DSCS III SATELLITE. WE BELIEVE, FROM THE RESULTS OF THE PHASE I SBIR EFFORT, THAT WE CAN PROVIDE TWO-WAY, 75, 300, AND 2400 BPS OPERATION BETWEEN A SMALL MANPACK TERMINAL AND A HUB. THE PRIMARY OBJECTIVE OF THIS PROGRAM IS TO DEMONSTRATE X-BAND COMMUNICATIONS BETWEEN A MANPACK TERMINAL AND A LARGE HUB. HOWEVER, A DEMONSTRATION OF KU-BAND OPERATION REPRESENTS A VIABLE ALTERNATIVE, SHOULD IT PROVE DIFFICULT TO GAIN ACCESS TO AN APPROPRIATE LARGE DSCS TERMINAL, AND IS OFFERED AS

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AN ALTERNATIVE.

RAMSEARCH CO
14622 SANDY RIDGE RD
SILVER SPRING, MD 20904
CONTRACT NUMBER: F33615-88-C-5515
MICHAEL OSTERMAN
TITLE:
A COMPUTERIZED METHODOLOGY FOR UNIFIED LIFE CYCLE ENGINEERING
EVALUATION OF DIGITAL ELECTRONICS
TOPIC# 90 OFFICE: AMD/RDO IDENT#: 20353

PROPOSED IS THE DEVELOPMENT OF SOFTWARE FOR UNIFIED LIFE CYCLE ENGINEERING (ULCE) DESIGN AND EVALUATION OF DIGITAL ELECTRONICS. THE SOFTWARE WILL BE CAPABLE OF INTEGRATING DIVERSE ANALYSIS PROGRAMS AND PROVIDING METHODS FOR RAPID REQUIREMENTS ALLOCATION AND VERIFICATION. THE DEVELOPED SYSTEM WILL BE USEFUL THROUGHOUT THE BIDDING, INITIAL AND FINAL DESIGN PROCESSES AS WELL AS DURING CUSTOMER EVALUATION OF PROPOSALS. THE DESIGN, EVALUATION, ANALYSIS INTEGRATION AND REQUIREMENTS ALLOCATION ARE ACCOMPLISHED BY USING TREE AND NETWORK STRUCTURES FOR REPRESENTING DESIGNS. THE CONCEPTUAL BASIS OF THE PROPOSED APPROACH TO ULCE DIGITAL ELECTRONICS DESIGN IS CALLED "DESIGN BY PROGRESSIVE APPROXIMATION." APPROPRIATE ARTIFICIAL INTELLIGENCE AND OTHER ADVANCED COMPUTER TECHNIQUES WILL BE EMPLOYED. CARE HAS BEEN TAKEN IN THE DESIGN OF A SUPPORTIVE USER INTERFACE. THE PHASE II DEVELOPMENT WILL BE BASED ON THE PROTOTYPE SOFTWARE COMPLETED DURING THE PHASE I PROJECT, WHICH PROVED THE FEASIBILITY AND USEFULNESS OF THIS APPROACH TO ULCE FOR DIGITAL ELECTRONICS.

RAMSEARCH CO
14622 SANDY RIDGE RD
SILVER SPRING, MD 20904
CONTRACT NUMBER: F33615-88-C-5700
GREGORY BRAUNBERG
TITLE:
COMPUTER-AIDED LIFE CYCLE ENGINEERING WORKSTATION: A DECISION
SUPPORT SYSTEM FOR COMPUTER-AIDED LIFE CYCLE ENGINEERING
TOPIC# 90 OFFICE: AMD/RDO IDENT#: 20354

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THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP A DECISION SUPPORT SOFTWARE SYSTEM FOR UNIFIED LIFE CYCLE ENGINEERING (ULCE), CALLED THE COMPUTER-AIDED LIFE CYCLE ENGINEERING (CALCE) WORKSTATION. THE CALCE WORKSTATION SOFTWARE SYSTEM IS AN INTELLIGENT SHELL STRUCTURE FOR A LIFE CYCLE, MULTI-OBJECTIVE DESIGN DECISION SUPPORT SYSTEM CAPABLE OF COMBINING HEURISTIC AND ALGORITHMIC APPROACHES TO DESIGN OPTIMIZATION. CALCE CAN BE ADAPTED BY EACH USING ORGANIZATION OF ITS OWN PARTICULAR LIFE CYCLE DESIGN CRITERIA. CALCE WILL INCLUDE SUPPORT FOR MULTI-GOAL MODELING, COOPERATIVE AND CONCURRENT DESIGN, NEGOTIATION AND ARBITRATION BETWEEN DESIGN GROUPS, TRADEOFFS AMONG COMPETING DESIGN GOALS, KNOWLEDGE-BASED DESIGN, AND INTERFACING WITH ANALYSIS AND CAD SOFTWARE. THE CALCE SYSTEM WILL BE USEFUL IN MECHANICAL, ELECTRONIC, AND SYSTEMS ENGINEERING. THE PHASE II PROJECT WILL CONSIST OF FULL-SCALE IMPLEMENTATION OF THE CALCE PROTOTYPE CREATED IN PHASE I.

RESOURCE INTERNATIONAL INC

281 ENTERPRISE DR

WESTERVILLE, OH 43081

CONTRACT NUMBER:

KAMRAN MAJIDZADEH

TITLE:

COMPOSITE MATERIAL TESTYER

TOPIC# 24

OFFICE: AEDC/DOT

IDENT#: 17451

THE DESIGN OF A DYNAMIC DEVICE CAPABLE OF ACHIEVING STRAIN RATES IN THE RANGE OF $10(4)/\text{MIN}$. FOR TESTING GRAPHITIC COMPOSITES IS DESCRIBED. THIS DEVICE WILL BE USED TO PERFORM TESTS IN TENSION, COMPRESSION AND SHEAR ON COMPOSITES TO EVALUATE DYNAMIC PROPERTIES FOR DESIGN PURPOSES. THE CONCEPTS DEVELOPED IN PHASE I OF THIS STUDY WILL BE APPLIED TO BUILDING AND INSTRUMENTING THE TESTING DEVICES AND TO MACHINE TEST SPECIMENS. VARIOUS INVESTIGATIONS WILL BE CARRIED OUT AND THE TEST RESULTS WILL BE USED TO REFINE THE TESTING APPARATUS AND SPECIMEN GEOMETRY. THE INSTRUMENT WILL BE CALIBRATED BY REPEATING TESTS CONDUCTED ON OTHER MATERIALS ELSEWHERE, AND RESULTS COMPARED.

S-TRON

101 TWIN DOLPHIN DR

REDWOOD CITY, CA 94065

CONTRACT NUMBER:

OLIVER J EDWARDS

TITLE:

SENSOR-AUGMENTED VISION SYSTEM

TOPIC# 85

OFFICE: AMD/RDO

IDENT#: 20069

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AVAILABLE NIGHT VISION AIDS FOR AIR CREW MEMBERS ARE NOT MATCHED TO THE TACTICAL MISSION. THE CONCLUSIONS OF THE PHASE I STUDY INCLUDED: (1) HEAD MOUNTED HEAD-UP DISPLAY WILL BE A COMMANDING BENEFIT IN COMBAT, PERMITTING NEAR-SIMULTANEOUS ENGAGEMENT OF NUMEROUS TARGETS THROUGHOUT THE HEMISPHERE; (2) PRESENT HELMET WEIGHT IS marginally ACCEPTABLE IN THE 6G-9G ENVIRONMENT, AND HEAD-MOUNTED MASS AND MOMENTS MUST BE DECREASED, NOT INCREASED, IN ADDING NIGHT VISION FUNCTIONS; (3) THIS REQUIRES AS FULL INTEGRATION OF THE ELECTRO-OPTICS VIDEO FUNCTIONS IN A NEW AND LIGHTWEIGHT ELECTRO-OPTICAL HELMET STRUCTURE; (4) IT IS VITAL TO TRACK AND INTERPRET PUPIL POSITION, FOR RAPID DESIGNATION AND CONSCIOUSNESS/ALERTNESS MEASUREMENT; AND (5) LASER EYE SAFETY MUST BE INTEGRATED IN THE DESIGN FROM INCEPTION. THIS PHASE II PROPOSAL DESCRIBES THE TECHNOLOGY AND PROGRAM TO IMPLEMENT THESE FUNCTIONS IN DEMONSTRATION HARDWARE FOR USAF INVESTIGATION AND TESTING.

SAM TECHNOLOGY INC
1855 FOLSOM ST - RM 610
SAN FRANCISCO, CA 94103
CONTRACT NUMBER: F49620-89-C
ALAN GEVINS

TITLE:

SIGNET--SOFTWARE TOOLS FOR SIGNAL IDENTIFICATION USING
NEURAL NETWORKS

TOPIC# 241 OFFICE: AFOSR/XOT IDENT#: 16557

WE PROPOSE TO DEVELOP AN EFFICIENT USER ENVIRONMENT, CALLED SIGNET, FOR APPLYING NEURAL NETWORK ALGORITHMS FOR FEATURE EXTRACTION AND CLASSIFICATION TO SIGNAL RECOGNITION PROBLEMS CHARACTERIZED BY LARGE AMOUNTS OF NOISY, MULTIDIMENSIONAL, TIME-VARYING DATA. THE OPERATION OF THE SIGNET SYSTEM WILL EMBODY THE PRINCIPLES AND PROCEDURES WE DEVELOPED AND SUCCESSFULLY APPLIED IN TEN YEARS OF BASIC RESEARCH ON MEASURING SUBTLE NEUROELECTRIC SIGNALS IN THE HUMAN BRAIN, WITH ADDITIONS TO THE FRONT-END ANALYSIS MODULES TO ALLOW TREATMENT OF OTHER TYPES OF MULTIDIMENTIONAL, NOISY SIGNALS, E.G., SPEECH, RADAR, AND SONAR. TOOLS FOR DEVELOPING NEURAL NETWORK ALGORITHMS WILL BE A COMPONENT OF THIS ENVIRONMENT. THUS, WE AIM TO DEVELOP AN ENVIRONMENT WITHIN WHICH TO EXPLORE THE APPLICATION OF THIS FLEDGING

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COMPUTATIONAL TECHNOLOGY TO REAL-WORLD SIGNAL PROCESSING PROBLEMS.
CONTINUING THE DEVELOPMENT OF THE USER ENVIRONMENT CREATED IN
PHASE I, THE SIGNET SYSTEM WILL BE DESIGNED TO BE USABLE ON
WORKSTATIONS WITH VECTOR ACCELERATOR BOARDS, ON MULTIPROCESSOR
COMPUTERS, AND ON SPECIAL PURPOSE NN DEVICES.

SAM TECHNOLOGY INC
1855 FOLSOM ST - RM 610
SAN FRANCISCO, CA 94103
CONTRACT NUMBER: F33615-87-C-0619
NELSON H MORGAN
TITLE:
FLIGHT HELMET EEG SYSTEM
TOPIC# 77 OFFICE: AMD/RDO IDENT#: 20066

THE AIM OF THE PROPOSED WORK IS TO BUILD AND TEST A PROTOTYPE
EIGHT-CHANNEL, NEUROELECTRIC SENSOR SYSTEM WITHIN A STANDARD AIR
FORCE HELMET SUITABLE FOR USE DURING FLIGHT OR IN SIMULATORS. THE
SYSTEM WILL HAVE HIGH NOISE IMMUNITY AND WILL BE VERY SIMPLE TO
APPLY. THE PHASE II EFFORT WILL INVOLVE DEVELOPMENT AND TESTING OF
A PROTOTYPE BASED ON THE SUCCESSFUL PHASE I DESIGN.

SCEEE SERVICES CORP (SSC)
1101 MASSACHUSETTS AVE
ST CLOUD, FL 32769
CONTRACT NUMBER:
DR GRANT E SECRIST
TITLE:
SITUATIONAL AWARENESS TRAINING SYSTEM (SATS)
TOPIC# 80 OFFICE: AMD/RDO IDENT#: 20067

THE COMBAT DATA FROM WORLD WAR II AND ALL SUBSEQUENT ARMED CONFLICTS
DEMONSTRATE THAT TACTICAL MISSION EFFECTIVENESS HINGES ON THE
EXCEPTIONAL PERFORMANCE OF A VERY FEW SUPERIOR FIGHTER-ATTACK PILOTS.
ONE OF THE MOST IMPORTANT CHARACTERISTICS THAT DISTINGUISHES TRULY
SUPERIOR FIGHTER-ATTACK PILOTS FROM THEIR LESS SUCCESSFUL PEERS IS
AN EXTRAORDINARILY KEEN SITUATIONAL AWARENESS. HEIGHTENED

SUBMITTED BY

SITUATIONAL AWARENESS IS LARGELY DEPENDENT ON PERCEPTUAL-COGNITIVE CAPABILITIES AND PROCESSES THAT ARE TYPICALLY UNDERDEVELOPED AND UNEXPLOITED. THE PHASE I INVESTIGATION CLEARLY DEMONSTRATED THE FEASIBILITY AND POTENTIAL OF SITUATIONAL AWARENESS TRAINING TO IMPROVE PERFORMANCE ON TASKS RELEVANT TO AERIAL COMBAT EFFECTIVENESS AND FLIGHT SAFETY. PHASE II WILL CAPITALIZE ON THE KNOWLEDGE GAINED FROM PHASE I AND OUR COMPREHENSIVE AIRCREW PERFORMANCE AND SITUATIONAL AWARENESS TRAINING SYSTEM (SATS). THE PHASE II EFFORT EMBRACES A NUMBER OF PERFORMANCE, SYSTEMS, AND SCIENTIFIC OBJECTIVES THAT CULMINATE IN THE DELIVERY OF A PROTOTYPE SATS AND FIVE OTHER MAJOR PRODUCTS TO THE U.S. AIR FORCE.

SCHWARTZ ELECTRO-OPTICS INC
45 WINTHROP ST
CONCORD, MA 01742
CONTRACT NUMBER: F19628-87C-0109
DR PETER F MOULTON
TITLE:
SOLID STATE LASERS FOR EYE-SAFE COHERENT LIDAR
TOPIC# 181 OFFICE: AFGL/XOP IDENT#: 16578

ONE OF THE ANTICIPATED USES FOR LASER-BASED REMOTE SENSING IS IN THE MEASUREMENT OF WIND VELOCITIES, BY OBSERVATION OF THE DOPPLER SPECTRUM OF LASER ENERGY SCATTERED BY AEROSOLS. PLANS FOR THE AIR FORCE DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP) INCLUDE THE DEPLOYMENT OF A GLOBAL-WIND-SENSING LIDAR USING A SATELLITE-BASED, PULSED, SINGLE-FREQUENCY LASER TRANSMITTER AND COHERENT DETECTION SYSTEM. PRACTICALLY ALL OF THE EXPERIMENTAL WORK ON COHERENT LIDAR TO DATE HAS INVOLVED THE USE OF CO2 LASERS, AND IT IS LIKELY THAT THE FIRST SPACE-BASED SYSTEMS WILL BE BASED ON CO2-LASER TECHNOLOGY. A MORE ATTRACTIVE LONG-TERM APPROACH TO COHERENT LIDAR FOR SPACE IS THE USE OF A SOLID STATE LASER EXCITED BY SEMICONDUCTOR-DIODE-LASER ARRAYS. SUCH AN ALL-SOLID-STATE SYSTEM IS POTENTIALLY MORE RELIABLE, COMPACT AND LIGHTER THAN A CO2-LASER SYSTEM. THESE CHARACTERISTICS ALL HIGHLY DESIRABLE FOR SPACEBORNE DEVICES. IN THIS PHASE II PROPOSAL WE DESCRIBED AN APPROACH FOR ADVANCING THE DEVELOPMENT OF AN EYE-SAFE, SOLID STATE LIDAR SYSTEM. THE INTENT OF THE WORK IS TO PERFORM BOTH SPECTROSCOPIC ANALYSIS AND A SERIES OF CRITICAL LASER EXPERIMENTS, IN ORDER TO DETERMINE THE FEASIBILITY OF CONSTRUCTING

SUBMITTED BY

THE EYE-SAFE SYSTEM.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
CONTRACT NUMBER: F49620-88-C-0113
HAROLD L GRUBIN
TITLE:
NUMERICAL SIMULATION OF THE FUNCTION OF SCIENTIFIC
INSTRUMENTATION FOR MEASURING THE SPEED OF ELECTRON DEVICES
TOPIC# 241 OFFICE: AFOSR/XOT IDENT#: 16554

THIS DOCUMENT DESCRIBES A PROGRAM TO ASSESS, THROUGH COMPREHENSIVE MONTE CARLO SIMULATIONS, THE MEASUREMENT PROCEDURES IMPLEMENTED FOR DETERMINING THE SPEED OF ELECTRONIC DEVICES. WHILE THE RESULTS OF THE PROGRAM ARE GENERIC, THEY ARE OBTAINED FOR A SPECIFIC MEASUREMENT CONFIGURATION AND FOR A SPECIFIC DEVICE. THE CONFIGURATION IS THAT OF THE UNIVERSITY OF ROCHESTER'S ELECTRO-OPTICAL SAMPLING TECHNIQUE; THE DEVICE IS THE PSEUDO-MORPHIC HIGH ELECTRON MOBILITY TRANSISTOR. THERE ARE SEVERAL GOALS OF THE PROGRAM: (1) ESTABLISH CONDITIONS FOR MEASURING THE SPEED OF THE DEVICE, (2) ESTABLISH DESIGN CONDITIONS FOR THE PSEUDO-MORPHIC HEMT THAT WILL PROVIDE OPTIMUM SPEED, AND THEN TEST THE DESIGN THROUGH SPEED CALCULATIONS, (3) DEMONSTRATE THAT THE SPEED OF THE DEVICE AND ANALOG POWER/FREQUENCY CONSTRAINTS ARE CLOSELY COUPLED. AN ADDITIONAL GOAL IS TO DESIGN EXPERIMENTS THAT MEASURE CURRENT OVERSHOOT AND VELOCITY OVERSHOOT. THE MONTE CARLO PROCEDURES WILL INCORPORATE QUANTIZATION OF THE ELECTRONS IN THE InGaAs CHANNEL, REAL SPACE TRANSFER AND 2D SCATTERING EFFECTS. IN ADDITION, THE EFFECTS OF CHANGING: (1) THE INDIUM MOLE FRACTION IN THE CHANNEL, (2) THE SUBSTRATE MATERIAL, AND (3) DEVICE DIMENSIONS, ON THE DC AND TRANSIENT PERFORMANCE OF THE PHEMT ARE TO BE STUDIED.

SIMULA INC
10016 - S 51ST ST
PHOENIX, AZ 85044
CONTRACT NUMBER:
JOSEPH W COLTMAN
TITLE:
DEVELOPMENT OF COMPOSITE MANIKIN SEGMENTS TO IMPROVE KINEMATIC RESPONSE IN AIR FORCE TEST MANIKINS
TOPIC# 87 OFFICE: AMD/RDO IDENT#: 20068

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THE KINEMATIC RESPONSE CHARACTERISTICS OF THE HUMAN BODY UNDERGOING DYNAMIC LOADING IN AN ADVANCED EJECTION SEAT ARE NOT WELL REPRESENTED BY EXISTING TEST MANIKINS. ONE OF THE PROBLEMS LIES IN THE LIMB SEGMENTS OF CURRENT TEST MANIKINS, WHERE THE MASS IS CONCENTRATED IN THE METALLIC SKELETON. THIS CONFIGURATION IS UNLIKE THE HUMAN WHERE THE MASS IS DISTRIBUTED THROUGHOUT THE SEGMENT. THE PURPOSE OF THIS PROPOSED SBIR PHASE II PROGRAM IS TO REDUCE THE WEIGHT OF THE SKELETAL COMPONENTS FOR THE UPPER AND LOWER LIMBS AND TO IMPROVE THE MASS MOMENTS OF INERTIA OF EACH SEGMENT. THE ADVANTAGES OF THE HIGH STRENGTH-TO-WEIGHT RATIO EXHIBITED BY COMPOSITES WILL BE APPLIED IN THE DESIGN EFFORT TO IMPROVE THE SKELETAL SEGMENTS AND JOINTS. SEGMENT PROPERTIES AND JOINT MOTION WILL BE ANALYZED AND THE ARTICULATED TOTAL BODY (ATB) MODEL WILL BE USED TO DETERMINE THE CRITICAL DESIGN LOADS. SKELETAL SEGMENTS AND JOINTS WILL BE DESIGNED, FABRICATED, AND STATICALLY TESTED. THE DESIGN AND FABRICATION OF FLESH COVERS IS PROPOSED AS AN OPTION TO IMPROVE THE WEIGHT DISTRIBUTION IN THE LIMBS. ALSO INCLUDED AS OPTIONS ARE ENVIRONMENTAL TESTING AND DYNAMIC TEST SUPPORT OF THE COMPOSITE SKELETON AND FLESH COVERINGS.

SOFTWELL ASSOCS INC
5 FLAGG LN
MILFORD, NH 03055
CONTRACT NUMBER: FY7615-89G-5112
DR SHAHRIAR MOVAFAGHI
TITLE:
UNIFIED LIFE CYCLE ENGINEERING
TOPIC# 90 OFFICE: AMD/RDO IDENT#: 20356

THE THREE MAJOR THRUSTS OF ULCE HAVE BEEN IDENTIFIED NAMELY, INFORMATION MANAGEMENT SYSTEMS, DECISION SUPPORT SYSTEMS, AND SUPPORTABILITY MODEL. SOFTWELL ASSOCIATES, INC. HAS CONTRIBUTED TO THE RESEARCH IN EACH OF THESE AREAS. IN PHASE II, WE INTEND TO DEVELOP AND IMPLEMENT THE KNOWLEDGE-BASED QUERY OPTIMIZER, AND VIEW UPDATE ALGORITHMS. THE SUCCESS CRITERIA FOR AN ULCE ENVIRONMENT IS PERFORMANCE. THE KNOWLEDGE-BASED QUERY OPTIMIZER PLAYS AN IMPORTANT ROLE IN THE PERFORMANCE OF A HETEROGENEOUS DISTRIBUTED DATABASE. IN THE AREAS OF THE DECISION SUPPORT SYSTEM, SOFTWELL ASSOCIATES, INC.

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INTENDS TO IMPLEMENT AN AUTOMATED CONFIGURATION MANAGEMENT SYSTEM AND AN AUTOMATED DESIGN PROCESS SEQUENCE CONTROL. IN THE AREA OF THE SUPPORTABILITY MODEL, SOFTWELL ASSOCIATES, INC INTENDS TO INTEGRATE A SUPPORTABILITY TOOL TO INGRES AND THEN TO IISS.

SPACE COMPUTER CORP
PO BOX 5937
SHERMAN OAKS, CA 91413
CONTRACT NUMBER: F33615-89-C-1000
WILLIAM J JACOBI
TITLE:

THREE-DIMENSIONAL WAFER-SCALE INTERCONNECT AND PACKAGING USING PHOTSENSITIVE GLASS-CERAMIC SUBSTRATES
TOPIC# 154 OFFICE: AFWAL/AA IDENT#: 16725

THE PURPOSE OF THIS PROGRAM IS TO DEVELOP A NEW MULTICHIP INTERCONNECT AND PACKAGING TECHNOLOGY FOR HIGH-DENSITY, HIGH-SPEED APPLICATIONS USING POLYIMIDE DIELECTRIC AND A PHOTSENSITIVE GLASS-CERAMIC SUBSTRATE MATERIAL. THE USE OF THIS SUBSTRATE MATERIAL PERMITS THE FABRICATION OF PRECISION THREE-DIMENSIONAL STRUCTURES FOR PLANAR WIRE (OR TAB) CHIP BONDS, METAL HEAT SINKS AND 3-D SUBSTRATE STACKING. IT ALSO PERMITS INTEGRATION OF THE FUNCTIONS OF CHIP INTERCONNECTION, MECHANICAL SUPPORT, HERMETIC SEALING AND EXTERNAL I/Q CONNECTION IN A SINGLE GLASS-CERAMIC PACKAGE. FABRICATION CAN BE CARRIED OUT USING CONVENTIONAL IC MANUFACTURING TECHNIQUES AND EQUIPMENT. THE PHASE II PROGRAM WILL EXTEND THE BASIC TECHNOLOGY DEVELOPED IN PHASE I TO INCLUDE DEMONSTRATIONS OF THERMAL MANAGEMENT, HERMETIC SEALING, CONTROLLED-IMPEDANCE TRANSMISSION LINES AND SUBSTRATE STACKING. FOR DEMONSTRATION PURPOSES, WE WILL APPLY THE EXTENDED TECHNOLOGY TO THE PACKAGING OF A PROGRAMMABLE, FINE-GRAINED, PARALLEL IMAGE PROCESSING ENGINE DESIGNED FOR LOW COST VLSI IMPLEMENTATION.

SPACE DATA CORP
1333 W 21ST ST
TEMPE, AZ 85282
CONTRACT NUMBER:
CLIFFORD P CHALFANT
TITLE:

LOW COST LAUNCH VEHICLE TEST FLIGHT
TOPIC# 206 OFFICE: BMO/MYSC IDENT#: 16754

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A LOW-COST LAUNCH VEHICLE (LCLV) WILL BE DEVELOPED AND FLIGHT TESTED. THE USE OF SURPLUS SOLID ROCKET MOTORS AND EXISTING COMPONENTS RESULTS IN OVERALL LOW PROGRAM COST. THE USE OF THESE MOTORS AND COMPONENTS ALSO ALLOWS A FAST-PACED SCHEDULE RESULTING IN A LAUNCH IN 12 MONTHS. THE LCLV IS A THREE STAGE GUIDED SOUNDING ROCKET UTILIZING THE TALOS BOOSTER; (STAGE 1), SERGEANT MOTOR (STAGE 3) AND THE MINUTE MAN I (MMI) STAGE 3 MOTOR AND INTERSTAGE. STAGES 1 AND 2 ARE TAKEN DIRECTLY FROM THE SDIO STARBIRD PROGRAM. STAGE 2 IS GUIDED THROUGH THE USE OF SURPLUS JETAVATORS. THE MMI STAGE 3 WILL BE GUIDED BY SWIVELLING ITS FOUR EXHAUST NOZZLES. THE STARBIRD GUIDANCE CONTROL COMPUTER WILL PROVIDE FULL INERTIAL GUIDANCE. DATA DURING THE FLIGHT TEST FROM AN ON-BOARD VEHICLE PERFORMANCE PACKAGE WILL BE TELEMETERED TO THE INSTRUMENTATION FACILITIES AT NASA'S WALLOPS FLIGHT STATION (WFS). A STANDARD ROCKET LAUNCHER WILL BE UTILIZED. RANGE SAFETY AND OPERATIONAL PROCEDURES WILL BE DEVELOPED FOR BOTH WFS AND THE KWAJALEIN MISSILE RANGE.

SPARTA INC
23293 S POINTE DR
LAGUNA HILLS, CA 92653
CONTRACT NUMBER:
ROBER RISS
TITLE:
ADVANCED BASING SYSTEM CONCEPT DEFINITION ASSESSMENT
TOPIC# 204 OFFICE: BMO/MYSC IDENT#: 16750

IN ORDER TO ASSESS COST EFFECTIVENESS AND PERFORMANCE CHARACTERISTICS OF VARIOUS LAND BASING MODES OF U.S. ICBMs, THE SURVIVABILITY, RESPONSIVENESS, ENDURANCE, AND TARGET DAMAGING POTENTIAL MUST BE DETERMINED. SPARTA PROPOSES TO COMPLETE THE DEVELOPMENT OF AN ANALYTIC TOOL CONSTRUCTED IN PHASE I. THE PROPOSED TOOL ENABLE THE ANALYSIS OF EXISTING AND PROJECTED FUTURE ADVANCED BASING OPTIONS FOR MINUTEMAN, PEACEKEEPER, AND THE SMALL ICBM. PHASE I OF THIS STUDY HAS PRODUCED A MODEL WHICH EVALUATES THE OPERATIONAL EFFECTIVENESS OF SELECTED TEST BASING OPTIONS. THE CURRENT PHASE I FORCEEXCHANGE MODEL ENABLES THE ANALYSIS OF MULTIPLE STRIKES AND COUNTERSTRIKES AS DESIGNATED BY THE USER. A CONTINUATION OF THIS EFFORT IS PROPOSED TO ALLOW EXPANSION OF THE MODEL TO INCLUDE THE

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FULL RANGE OF PRESENT AND PROJECTED FUTURE BASING MODES. IN PARTICULAR, A SOPHISTICATED DEEP BASE MODULE CAPABLE OF MODELING MULTIMODE BASING WITH SHALLOW TUNNEL AND/OR HARDENED LAUNCH PORTAL EXTENSIONS MUST BE ADDED. UPGRADES TO THE ALLOCATION ALGORITHM ARE PROPOSED TO INCLUDE DYNAMIC DETERMINATION OF FORCE LEVELS AND WITHHOLDS AT EACH WAVE OF THE CONFLICT. FINALLY, AN EXAMINATION OF THE ENTIRE BASING SCHEME IS ALSO PROPOSED TO PROVIDE THE INFORMATION TO OPTIONALLY AND AUTOMATICALLY RECONFIGURE THE SYSTEM TO ATTAIN OPTIMAL SYSTEM EFFECTIVENESS.

SPARTA INC
PO BOX 1354 - 1055 WALL ST/STE 200
LA JOLLA, CA 92038
CONTRACT NUMBER:
DR H M BERKOWITZ
TITLE:
OPTIMAL AIRFRAMES FOR HIGH PERFORMANCE RVs
TOPIC# 210 OFFICE: BMO/MYSC IDENT#: 16760

THE OBJECTIVE OF THIS PROGRAM IS TO DEMONSTRATE THE WEIGHT SAVINGS THAT CAN BE ACHIEVED WITHIN THE CURRENT STATE-OF-THE-ART BY UTILIZING ADVANCED, HIGH TEMPERATURE, SUBSTRUCTURE MATERIALS AND STRUCTURAL CONCEPTS TO OPTIMIZE THE DESIGNS OF AIRFRAMES (HEATSHIELDS PLUS SUBSTRUCTURES) OF ADVANCED, HIGH PERFORMANCE BALLISTIC AND MANEUVERING RVs. THE PROGRAM WILL ENTAIL DESIGN, ANALYSIS, MATERIAL PROPERTIES CHARACTERIZATION TESTING, STRUCTURAL SUBSYSTEM TESTING, AND PROOF TESTING OF THE AIRFRAME STRUCTURAL CONCEPT. AIRFRAMES FOR SMALL BRV AND EVADER AND SEEKER MaRVs WILL BE DESIGNED AND ANALYZED USING A VARIETY OF MONOCOQUE AND HONEYCOMB-CORE-SANDWICH CONSTRUCTION SUBSTRUCTURES MADE FROM ADVANCED RESIN MATRIX AND METAL MATRIX COMPOSITES THAT POSSESS GOOD ELEVATED TEMPERATURE STRENGTH AND STIFFNESS PROPERTIES. MECHANICAL PROPERTIES AS FUNCTIONS OF TEMPERATURE WILL BE CHARACTERIZED FOR A REPRESENTATIVE OPTIMAL SUBSTRUCTURE MATERIAL CONCEPT. TESTS WILL BE CONDUCTED OF HEATSHIELD TO SUBSTRUCTURE MECHANICAL ATTACHMENT AND SUBSTRUCTURE JOINT CONCEPTS, AND A REPRESENTATIVE CONICAL FRUSTUM WILL BE PROOF TESTED, TO VALIDATE THE DESIGNS AND VERIFY ANALYTICAL PREDICTIONS.

SPARTA INC
23041 DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
CONTRACT NUMBER: F04704-87-C-0128
HARRY B DYNER
TITLE:
ANTI-SIMULATION CONCEPTS
TOPIC# 218 OFFICE: BMO/MYSC IDENT#: 16769

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ONE APPROACH TO PENETRATION AID SYSTEMS FOR STRATEGIC BALLISTIC MISSILES RELIES ON THE USE OF REPLICA OR SIMULATION DECOYS TO CONFUSE THE ENEMY. SIMULATION OF THE OBSERVABLE CHARACTERISTICS OF THE LARGE REENTRY VEHICLES WITH SMALL REPLICAL DECOYS IS A DIFFICULT TECHNOLOGY. ANTI-SIMULATION IS A TECHNIQUE WHEREBY THE STATISTICAL DISTRIBUTION OF THE REENTRY VEHICLE OBSERVABLES IS BROADENED AND, IF POSSIBLE, SHIFTED CLOSER TOWARD THAT OF THE DECOYS. SPARTA, INC., IN THEIR PHASE I SBIR, ANALYZED EXISTING REENTRY VEHICLE FLIGHT DATA AND DETERMINED THAT, WITH ONLY MINOR CHANGES TO THE VEHICLE CONFIGURATION, ANTI-SIMULATION WAS EVIDENT FOR ONE PARTICULAR RADAR OBSERVABLE. SPARTA PROPOSES TO DETERMINE THE CAUSE OF THIS ANTI-SIMULATION IN ORDER TO FORMULATE A DESIGN SOLUTION THAT MAY EFFECTIVELY BE USED WITH OUR EXISTING REENTRY VEHICLE FLEET. IN ADDITION, SPARTA PROPOSES TO INVESTIGATE THE EFFECTS OF THIS CONFIGURATION CHANGE ON OTHER OBSERVABLE TO ENSURE THAT APPLICATION OF THE CHANGE IN VEHICLE CONFIGURATION IS NOT EASILY DETECTED.

SPECTRUM 39 (SI DIVISION)

3811 CANTERBURY RD

BALTIMORE, MD 21218

CONTRACT NUMBER: F19628-87-C-

TODD L SCHUMAN

TITLE:

ADVANCED DESIGN CONCEPTS FOR ELECTRONIC EQUIPMENT SHELTERS

TOPIC# 29

OFFICE: ESD/XR

IDENT#: 20283

IN PHASE I, SI DEVELOPED NON-BALLISTIC AND BALLISTIC HARDENED SHELTER CONCEPTS. THE CONCEPTS INCORPORATED THE USE OF COMPOSITE MATERIALS. IN PHASE II, SI PROPOSES TO DEVELOP A BALLISTIC HARDENED SHELTER CONSTRUCTED OF STRUCTURAL ARMOR. SI WILL PRODUCE A DETAIL DESIGN AND FABRICATE A PROTOTYPE S280C SIZE SHELTER. THE DATA PRODUCED IN PHASE II WILL BE USED ON THE NEXT GENERATION OF AIR FORCE ELECTRONIC EQUIPMENT SHELTERS.

SPIRE CORP

PATRIOTS PK

BEDFORD, MA 01730

CONTRACT NUMBER: F33615-88-C-2906

DR ROBERT G WOLFSON

TITLE:

HIGHLY TEMPERATURE-STABLE LOW SHADOW LOSS METALLIZATION FOR SUPERIOR SPACE SOLAR CELLS

TOPIC# 124

OFFICE: AFWAL/FO

IDENT#: 16685

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THE PROPOSED PROGRAM INVESTIGATES THE INTEGRATION OF A VERY STABLE METALLIZATION SYSTEM WITH A METAL FORMATION PROCESS YIELDING A HIGHLY EFFICIENT LOW-LOSS CONFIGURATION. THE LOW-LOSS METALLIZATION COMPRISES HIGH-ASPECT-RATIO GRID LINES WHICH CAN BE MADE TALL TO LIMIT GRID SERIES RESISTANCE WITHOUT INCREASING SHADOW LOSS. HIGH TEMPERATURE STABILITY IS OBTAINED BY EMPLOYING TiN DIFFUSION BARRIERS AND THERMODYNAMICALLY STABLE COMPOUNDS FOR OHMIC CONTACTS. THE FEASIBILITY OF THIS APPROACH HAS BEEN PROVEN IN PHASE I. IN PHASE II, RESEARCH LEADING TO PROTOTYPE CELLS WILL BE CARRIED OUT. THE GOAL WILL BE TO DEMONSTRATE THERMALLY STABLE, LOW SHADOW LOSS, SPACE-QUALIFIED CELLS OF GaAs (SINGLE JUNCTION) AND GaAs/Ge (MONOLITHIC TANDEM). THIS WILL LEAD DIRECTLY TO COMMERCIALIZATION IN PHASE III.

SRS TECHNOLOGIES

990 EXPLORER BLVD NW

HUNTSVILLE, AL 35806

CONTRACT NUMBER: 30602-88-C-0143

JEFFREY S YALOWITZ

TITLE:

INTEGRATED EXPERT SYSTEM FOR SENTIENT RADIO RECEIVERS

TOPIC# 49 OFFICE: RADC/XPX IDENT#: 16212

NEW METHODS OF IMPROVING QUALITY OF RADIO RECEPTION ARE NEEDED WHICH INCORPORATE AWARENESS OF THE ELECTROMAGNETIC AND MISSION ENVIRONMENTS INTO COMMUNICATIONS RECEIVERS. THE PHASE I EFFORT ESTABLISHED FEASIBILITY OF THE INTEGRATED USE OF EXPERT SYSTEMS AND ADAPTIVE SIGNAL PROCESSING TECHNIQUES TO RECOGNIZE ADVERSE CONDITIONS IN THE COMMUNICATIONS CHANNEL AND TO MAKE INTELLIGENT SYSTEM ADJUSTMENTS WHICH PROVIDE THE BEST OVERALL RECEIVER PERFORMANCE UNDER THOSE CONDITIONS. EMPHASIS WAS PLACED ON PROCESSING ARCHITECTURES AND HYBRID ALGORITHM APPROACHES WHICH COMBINE HEURISTIC METHODS WITH CONVENTIONAL DECISION/ESTIMATION THEORY AND MODERN CONTROL THEORY METHODS TO PRODUCE ADAPTIVE RECEIVER CONTROL STRATEGIES IN REAL TIME FROM AVAILABLE DATA. IN PHASE II, SRS WILL PERFORM PRINCIPAL RESEARCH AND TESTBED EVALUATION OF A SENTIENT RADIO RECEIVER WHICH INCORPORATES A CONVENTIONAL RECEIVER; PROCESSING ELEMENTS HOUSING A REAL-TIME EXPERT SYSTEM, NUMERICAL ALGORITHMS, AND KNOWLEDGE BASE SOFTWARE; AND RECEIVER/PROCESSOR INTERFACES EMPLOYING BOTH DATA

SUBMITTED BY

BUSSES AND SPECIALIZED SIGNAL CONDITIONING CIRCUITS FOR RF CHANNEL
SENSING AND ADAPTIVE CONTROL OF THE RECEIVER.

SUMMIT ANALYTICAL SCIENCES INC
1867 AUSTIN BLUFFS PKWY - #202
COLORADO SPRINGS, CO 80907
CONTRACT NUMBER:

DR MARIJKE AUGUSTEIJN

TITLE:

INTELLIGENT TRAINING SYSTEMS

TOPIC# 83 OFFICE: AMD/RDO

IDENT#: 20070

IN PHASE I WE HAVE DEVELOPED A PROTOTYPE INTELLIGENT TRAINING
SYSTEM (ITS). THE DESIGN OF THE PROTOTYPE IS DOMAIN INDEPENDENT;
THE AREA OF INSTRUCTION IS ORBITAL DYNAMICS. IN PHASE II WE INTEND
TO EXPAND THE PROTOTYPE INTO AN ITS THAT WILL TEACH A COMPLETE
INTRODUCTORY COURSE IN ORBITAL DYNAMICS. THE ITS WILL ADAPT TO THE
LEARNING STYLE OF THE STUDENT, COACH THE STUDENT DURING PROBLEM
SOLVING, AND ANALYZE THE STUDENT'S ERRORS. THE SYSTEM WILL BE
VALIDATED BY MEANS OF STUDENT TESTING. IN ADDITION, WE PLAN TO
DEVELOP AN INSTRUCTOR INTERFACE THAT WILL ENABLE AN INSTRUCTOR, WHO
IS NOT A PROGRAMMER, TO INSERT INSTRUCTIONAL MATERIAL INTO THE ITS.
WE WILL TEST THE EFFECTIVENESS OF THIS INTERFACE AND THE DOMAIN
INDEPENDENCE OF THE ITS DESIGN THROUGH THE DEVELOPMENT OF A SECOND
ITS, WHICH WILL INSTRUCT IN CALCULUS. THE PHASE II EFFORT WILL
RESULT IN THREE PRODUCTS, TWO ITSS AND THE INSTRUCTOR INTERFACE,
EACH OF WHICH WILL HAVE SIGNIFICANT MILITARY AND COMMERCIAL VALUE.

TACAN CORP

2111 PALOMAR AIRPORT RD - STE 270

CARLSBAD, CA 92008

CONTRACT NUMBER: F33615-88-C-2905

DR MICHAEL M SALOUR

TITLE:

FIBER OPTIC TEMPERATURE SENSOR FOR TURBINE ENGINE APPLICATIONS

TOPIC# 138 OFFICE: AFWAL/PO IDENT#: 16703

WE PROPOSE THE DEVELOPMENT OF A NOVEL HIGH-TEMPERATURE FIBER OPTIC

SUBMITTED BY

THERMOMETER BASED UPON A PATENTED TECHNOLOGY INVOLVING BOTH THE FIBER OPTIC THERMOMETRY AND ULTRAHIGH SPEED SIGNAL PROCESSING IN TURBINE ENGINE ENVIRONMENTS. NEW MATERIALS AND SIGNAL PROCESSING METHODS WERE IDENTIFIED IN OUR PHASE I EFFORTS AND WILL BE FULLY INVESTIGATED HERE FOR IMPROVED HIGH-TEMPERATURE PERFORMANCE. THE USE OF COMBINED CERAMIC COATINGS, REFRACTORY OXIDE OPTICAL FIBERS, AND HIGH TEMPERATURE SENSING ELEMENTS WILL ALLOW FOR EMBEDDED SENSORS IN TURBINE TEST COMPONENTS. THE VERY SMALL FIBER SIZE WILL MINIMIZE FLOW DISTURBANCE. THE PROPOSED DEVICE WILL HAVE SIGNIFICANT IMPROVEMENTS OVER CONVENTIONAL OPTICAL PYROMETRY FOR TEMPERATURE MEASUREMENT. THE PROPOSED FIBER OPTIC SENSOR CAN GIVE VERY HIGH SPATIAL RESOLUTION TEMPERATURE MEASUREMENTS WITH SUB MILLISECOND RESPONSE TIME AND EXTREMELY HIGH TEMPERATURE ACCURACY.

TAU CORP
485 ALBERTO WY - BLDG D
LOS GATOS, CA 95030
CONTRACT NUMBER: F33615-88-C-1863
G JEFFREY GEIER
TITLE:
TRANSFER ALIGNMENT TECHNIQUES FOR HYPERSONIC WEAPON APPLICATIONS
TOPIC# 150 OFFICE: AFWAL/AA IDENT#: 16720

THE TRANSFER ALIGNMENT TECHNIQUES DEVELOPED AS PART OF THE PHASE I RESEARCH WERE DEMONSTRATED TO BE CONCEPTUALLY SOUND USING SIMPLIFIED SIMULATION CAPABILITIES. IN THIS PROPOSED EFFORT FOR PHASE II, THE ALGORITHMS WILL BE DEVELOPED AND TESTED FURTHER IN A "SYSTEM-LEVEL" SIMULATION WHICH MODELS THE CARRIER PREALIGNMENT PRIOR TO THE START OF TRANSFER ALIGNMENT, AND THE WEAPON LAUNCH AT THE CONCLUSION OF THE TRANSFER ALIGNMENT PROCESS (TO THE POINT WHERE TFS ACQUISITION CAN OCCUR). THE ALGORITHM INTERFACES WILL BE SIMULATED REALISTICALLY, SUCH THAT THE ALGORITHM CAN BE READILY TRANSFERRED TO AN OPERATIONAL ENVIRONMENT. FINALLY, THE SIMULATION WILL BE DELIVERED TO THE AIR FORCE TO PERMIT FURTHER EVALUATION OF SIMILAR WEAPONS CONCEPTS.

TAU CORP
485 ALBERTO WY - BLDG D
LOS GATOS, CA 95030
CONTRACT NUMBER: F33615-87-C-0193
PATRICK CIGANER
TITLE:
KNOWLEDGE-BASED ATTACK PLANNING AND STEERING IN BEYOND VISUAL RANGE ENGAGEMENTS
TOPIC# 162 OFFICE: ASD/XR IDENT#: 16743

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THE FORECASTED TACTICAL AIR-TO-AIR ENVIRONMENT OF 1990'S AND EARLY 21ST CENTURY WILL REQUIRE THE DEVELOPMENT OF ADVANCED AIRCRAFT SYSTEMS AND NEW AIR-TO-AIR COMBAT TACTICS. CURRENTLY AVAILABLE STAND ALONE ENGINEERING MODELS ARE NOT SUFFICIENT TO DEMONSTRATE THE UTILITY OF NEW SYSTEMS IN REALISTIC COMBAT ENVIRONMENTS. LARGE MAN-IN-THE-LOOP SIMULATIONS CAN REALISTICALLY EVALUATE NEW TECHNOLOGIES, BUT THE HIGH COSTS OF USING THESE SIMULATIONS, AND THE REQUIREMENT TO EMPLOY NUMEROUS EXPERIENCED PILOTS IN THEIR OPERATION MAKE THE USE OF THESE SIMULATIONS UNDESIRABLE FOR MANY APPLICATIONS. BASED ON THESE CONSIDERATIONS IT CAN BE SEEN THAT THERE EXISTS A SIGNIFICANT GAP BETWEEN THE NEED TO EVALUATE POTENTIALLY USEFUL AIRCRAFT TECHNOLOGIES AND AIR COMBAT TACTICS, AND OUR ABILITY TO DO SO IN AN ECONOMICALLY FEASIBLE AND TIMELY MANNER. THE DEVELOPMENT OF INTELLIGENT SIMULATION ENVIRONMENTS USING KNOWLEDGE-BASED SYSTEM DEVELOPMENT TOOLS HAS THE POTENTIAL TO NARROW THIS GAP. THIS PHASE II PROJECT WILL EXPAND THE PHASE I EFFORT IN WHICH TAU DEVELOPED A PROOF OF CONCEPT TACTICAL DECISION SUPPORT SYSTEM (TDSS) FOR BEYOND VISUAL RANGE (BVR) AIR-TO-AIR COMBAT. THE GOAL OF THIS SBIR PROJECT IS TO DEVELOP A PROTOTYPE KNOWLEDGE-BASED ATTACK PLANNING (KBAP) SYSTEM FOR USE IN MISSION SPECIFIC SIMULATIONS OF EXISTING AND PROPOSED AIRCRAFT.

TAWD SYSTEMS INC
1000 ELWELL CT - STE 136
PALO ALTO, CA 94303
CONTRACT NUMBER: F33617-88-C-1005
EUGENE L TRABITZ
TITLE:
COMMUNICATION REQUIREMENTS FOR HYPERVELOCITY VEHICLES
TOPIC# 145 OFFICE: AFWAL/AA IDENT#: 16714

THIS SBIR PHASE II-PROGRAM EFFORT ON HYPERVELOCITY VEHICLES (HVV) COMMUNICATION REQUIREMENTS WILL IDENTIFY, DEVELOP AND DOCUMENT THE COMMUNICATION TECHNOLOGIES AND DATA TRANSMISSION REQUIREMENTS FOR FUTURE HVV PROGRAMS BASED ON VEHICLE USERS PLANNED MISSION SCENARIOS AND THEIR CONCEPTS OF OPERATIONS. CURRENTLY, THE USERS OPTIONS COVERING INTENDED MISSIONS SCENARIOS, VEHICLE TYPE, FLEET SIZE AND USE ARE OPEN ENDED, WHILE COMMUNICATIONS AND DATA TRANSMISSION RE-

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QUIREMENTS WILL NECESSARILY VARY ACCORDING TO THE VEHICLE SPECIFIC USE. VIABLE TECHNOLOGY CANDIDATES WILL BE STUDIED AND APPROPRIATE COMMUNICATION AND DATA LINK INTERFACES FOR EACH WILL BE IDENTIFIED. THE NATIONAL AEROSPACE PLANE (NASP) PROGRAM IS THE MOST IMPORTANT AND THE MOST VISIBLE HVV EFFORT NOW UNDERWAY. THE NASP PROGRAM WILL BE CLOSELY MONITORED IN THIS EFFORT ALONG WITH OTHER HVV CANDIDATES, SUCH AS THE BOOST-GLIDE VEHICLE NOW BEING STUDIED BY THE AIR FORCE AND DARPA. AFSPACECOM AND SAC WILL BE ENLISTED TO FURNISH OPERATIONAL SCENARIO DESCRIPTIONS WHICH WILL BE USED TO SUPPORT THE DEVELOPMENT OF DETAILED COMMUNICATION SUPPORT REQUIREMENTS AND A SET OF PERFORMANCE SPECIFICATIONS FOR AN HVV COMMUNICATION SIMULATION. THE SIGNIFICANCE OF THESE PRODUCTS MAY IMPACT COMMUNICATION SYSTEMS CONFIGURATIONS AND PERFORMANCE REQUIRING REDESIGN RECONSIDERATIONS, OR RECOGNITION OF VEHICLES OPERATIONAL LIMITATIONS.

TECH-TEAM INC
16621 SE 21ST PL
BELLEVUE, WA 98008
CONTRACT NUMBER: 87-C-0361
B JONER/J W WILLIAMS

TITLE:

CONCEPTS FOR ADVANCED WEAPON SUSPENSION DEVICES DEMONSTRATION
TESTING

TOPIC# 8 OFFICE: AFATL/FAV IDENT#: 16515

THE PHASE I STUDY AND DEVELOPMENT OF ADVANCED WEAPON SUSPENSION DEVICES DEFINED A NO-DRAG LUG CONCEPT FOR A BOMB WEAPON AND A NO-DRAG LAUNCHING HANGERS FOR MISSILES. DEMONSTRATION OF THE FEASIBILITY OF THE TWO ADVANCED CONCEPTS IS PROPOSED. DETAIL DESIGNS OF FULL SCALE DEVICES FOR MOUNTING IN DUMMY WEAPONS (ALSO TO BE DESIGNED) WILL BE MADE. FOLLOWING FABRICATION AND ASSEMBLY THE STRUCTURAL INTEGRITY AND FUNCTIONAL CAPABIITIES WILL BE DEMONSTRATED BY LIMITED LABORATORY TESTING. THE TESTING WILL COMPRISE STATIC LOAD TESTING, VIBRATORY TESTING AND RELEASE TESTING.

TECHNOCHEM CO
1001 S MARSHALL - STE 39
WINSTON-SALEM, NC 27101
CONTRACT NUMBER: F33615-88-C-2911
DR SHYAM D ARGADE

TITLE:

CHLORINE ELECTRODES FOR MOLTEN SALT BATTERIES

TOPIC# 124 OFFICE: AFWAL/PO IDENT#: 16686

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FUTURE MILITARY SPACE MISSIONS WILL REQUIRE ELECTROCHEMICAL ENERGY STORAGE DEVICES THAT CAN DELIVER PEAK/PULSE POWER LEVELS OF 100 kW TO 100 MW AND SUSTAINED POWER LEVELS OF 100 kW. THE PHASE I PROGRAM FOCUSED ON THE ACTIVATION OF CHLORINE ELECTRODES FOR LITHIUM-CHLORINE MOLTEN-SALT BATTERIES FOR THESE APPLICATIONS. A NOVEL ELECTRO-CHEMICAL ACTIVATION TECHNIQUE WAS FOUND TO BE FAR SUPERIOR TO THERMAL ACTIVATION. AN ACTIVATED POROUS GRAPHITE EXHIBITED PERFORMANCE A FACTOR OF THREE BETTER THAN A WELL-KNOWN FUEL CELL-GRADE CARBON. THESE NON-OPTIMIZED ACTIVATED CHLORINE ELECTRODES DELIVERED A REMARKABLE LEVEL OF PULSE-CURRENT PERFORMANCE IN MOLTEN LiCl-KCl. IN PROPERLY ENGINEERED BATTERIES, CURRENT PULSES CORRESPONDING TO 83 W/sq OR 36 kW/kg, ARE POSSIBLE BASED ON THE OBSERVED PERFORMANCE. WITH RECURRING DISCHARGE PULSES AND CHARGE AUGMENTATION, AN ENERGY DENSITY OF 1-10 MJ/kg IS PROJECTED. A PROPOSED PHASE II PROGRAM WILL CONCENTRATE ON DEVELOPING A DEVICE BASED ON OPTIMIZED CHLORINE ELECTRODES AND ACTIVATION TREATMENTS. ASPECTS OF CELL DESIGNS, MATERIALS AND SEALING TECHNIQUES WILL BE EVALUATED AT A MEANINGFUL SCALE.

TECHNOLOGY DEVELOPMENT ASSOCS INC
1667 COLE BLVD - STE 400
GOLDEN, CO 80401
CONTRACT NUMBER: F33615-88-C-2901
MICHAEL E KARPUK
TITLE:
METHANOL AS A HEAT-SINK FUEL FOR HYPERSONIC AIRCRAFT
TOPIC# 133 OFFICE: AFWAL/PO IDENT#: 16697

HYPERSONIC FLIGHT PRESENTS MANY TECHNICAL CHALLENGES TO AIRCRAFT DESIGNERS, ONE OF WHICH IS THE HIGH STAGNATION TEMPERATURES ENCOUNTERED BY THE AIRCRAFT. BECAUSE OF MATERIAL LIMITATIONS, COOLING MAY HAVE TO BE PROVIDED TO AIRFOIL LEADING EDGES AND TO ENGINE INTERNAL STRUCTURES. FUEL SENSIBLE HEATING AND ENDOTHERMIC REACTIONS COULD PROVIDE THE REQUIRED COOLING. UNDER THE SBIR PHASE I EFFORT, TECHNOLOGY DEVELOPMENT ASSOCIATES INC. (TDA) INVESTIGATED METHANOL DISSOCIATION TO H₂ AND CO AS A METHOD TO ABSORB HEAT ON BOARD HYPERSONIC AIRCRAFT. METHANOL DISSOCIATION, ALONG WITH VAPORIZATION AND SENSIBLE HEATING OF THE METHANOL TO REACTION TEMPERATURE AND

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SENSIBLE HEATING OF THE H2 AND CO TO HIGH TEMPERATURE, COULD ADSORB MORE THAN 6,972 kJ/kg (3,000 BTU/lb) OF METHANOL. DURING PHASE II, TDA WILL CONTINUE TO DEVELOP METHANOL DISSOCIATION TECHNOLOGY FOR HYPERSONIC AIRCRAFT. METHANOL DISSOCIATION CATALYSTS WILL BE TESTED AT CONDITIONS EXPECTED ON-BOARD HYPERSONIC AIRCRAFT. ENGINEERING SCALE METHANOL DISSOCIATION REACTORS WILL BE FABRICATED AND TESTED.

TECHNOLOGY DEVELOPMENT CORP

621 SIX FLAGS DR
ARLINGTON, TX 76011

CONTRACT NUMBER:

PAUL T ECKERT

TITLE:

DEVELOPMENT OF THE TEXTUAL AUTOMATED REDUCTION SYSTEM (TARS)

TOPIC# 83 OFFICE: AMD/RDO IDENT#: 20071

THE TEXTUAL AUTOMATED REDUCTION SYSTEM (TARS) IS A UNIQUE NATURAL-LANGUAGE (NL) PARSER WHICH ACTS TO REDUCE A STREAM OF NARROW DOMAIN TEXT INTO AN INTERMEDIATE FORM, WHICH ITSELF IS CONVERTED INTO A STREAM OF SINGLE-CLAUSE SIMPLIFIED ENGLISH LANGUAGE CONSTRUCTS CONNECTED BY LOGICAL CONNECTIVES. FROM THIS LATTER FORM, THE CLAUSES ARE CONVERTED TO PROTOTYPICAL EXPERT SYSTEM "RULES" BASED ON A CONFIGURATION FILE WHICH DIRECTS THE CONVERSION. THE ENTIRE SYSTEM IS BASED UPON REAL-TIME FEEDBACK BETWEEN ALL THREE CONVERSION PROCESSES, RESULTING IN A NATURAL-LANGUAGE SPREADSHEET OPERATION FOR THE USER THAT IS INTUITIVE AND FRIENDLY. BY AVOIDING EXHAUSTIVE NL CONVERSION AND ANALYSIS, TARS IS ABLE TO PERFORM NL STREAM CONVERSIONS IN REAL-TIME, AND IS UNIQUE IN REQUIRING THAT AN ENGLISH-SPEAKER (THE USER) BE KEPT IN THE CONVERSION LOOP AS THE FINAL ARBITER OF SEMANTICALLY- OR SYNTACTICALLY DIFFICULT SENTENCE CONVERSIONS. SINCE THE ENGLISH-LANGUAGE SPEAKER ACTS AS THE FINAL AUTHORITY ON "MEANING", PITFALLS INHERENT IN THE ABSOLUTE IDENTIFICATION OF "MEANING" FROM THE SOURCE TEXT ARE AVOIDED.

TECOLOTE RESEARCH INC

5290 OVERPASS RD - BLDG D
SANTA BARBARA, CA 93111

CONTRACT NUMBER: F04701-87-C-0120

JAMES H SUTTLE

TITLE:

ON-ORBIT COSTS BETWEEN A DISTRIBUTED SPARSE ARRAY RADAR SYSTEM AND A MONOLITHIC SPACE-BASED RADAR SYSTEM

TOPIC# 175 OFFICE: SD/SPO IDENT#: 16573

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A DESCRIPTION OF THE COMPARATIVE LIFE CYCLE COST (LCC) METHODOLOGY AND ASSOCIATED COST MODEL FOR SPACE-BASED RADAR SYSTEMS IS PRESENTED. RADAR COSTS ARE ESTIMATED AT THE SUBSYSTEM WORK BREAKDOWN STRUCTURE (WBS) LEVEL FOR EACH MAJOR LIFE CYCLE PHASE (R&D, PRODUCTION, AND O&S) USING BOTH TECHNICAL RADAR AND OPERATIONAL PARAMETERS. THIS MODEL, THE SPACE RADAR COST MODEL (SRCM), EVALUATES ALTERNATIVE SPACE RADAR CONCEPTS BASED ON TOTAL SYSTEM LIFE CYCLE COST AND FINANCIAL ANALYSIS. TRADE STUDIES AVAILABLE WITH THIS MODEL INCLUDE SYSTEM LEVEL COMPARISONS BETWEEN DIFFERENT MONOLITHIC RADAR SYSTEMS, DIFFERENT DISTRIBUTED ARRAY RADAR (DAR) SYSTEMS, AND MONOLITHIC AND DAR SYSTEMS. ADDITIONALLY, SUBSYSTEM LEVEL COMPARISONS MAY BE PERFORMED WITHIN AN INDIVIDUAL RADAR SYSTEM. FURTHERMORE, THIS MODEL ALLOWS THE GENERATION OF PERFORMANCE AND COST INFORMATION FOR A DAR SYSTEM EQUIVALENT TO AN INPUT MONOLITHIC RADAR DESIGN. THE SYSTEM TRADE STUDIES ALLOW COST SENSITIVITIES TO BE CALCULATED FOR THE FOLLOWING ITEMS; SYSTEM ECONOMIC LIFE, MISSION REQUIREMENTS, MANUFACTURING ASSUMPTIONS, COST PARAMETERS, RELIABILITY, SURVIVABILITY, TRANSPORTATION SYSTEMS, AND SPACE SERVICING VS REPLACEMENT OPTIONS. THIS MODEL ALLOWS AIR FORCE DEVELOPMENT PLANNERS TO MAKE INFORMED PROGRAM DECISIONS ON ALTERNATIVE RADAR SYSTEM CANDIDATES BASED ON TECHNICAL, PERFORMANCE, LIFE CYCLE COST AND ECONOMIC FACTORS.

TERRA TEK INC
400 WAKARA WY
SALT LAKE CITY, UT 84108
CONTRACT NUMBER: F33615-89-C-3216
SIDNEY J GREEN

TITLE:

APPLICATION OF NEW TECHNOLOGY TO PROVIDE AN INTEGRATED
SYSTEM FOR DIGITAL MEASUREMENTS OF STRAIN AT EXTREME TEMPERATURES
TOPIC# 109 OFFICE: AFWAL/FI IDENT#: 16664

THIS PROPOSAL REPORTS IN SUMMARY THE SUCCESSFUL EXPERIMENTS CONDUCTED IN PHASE I TO DEMONSTRATE THE FEASIBILITY OF THE PROPOSED METHOD. TEST SAMPLES WERE COATED USING RADIO FREQUENCY SPUTTERING EQUIPMENT. THE SAMPLES WERE THEN HEATED AT TEMPERATURES UP TO 4000 DEG F TO DEMONSTRATE THE STABILITY OF THE GAUGE MARKS. ALSO

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REPORTED ARE RESULTS OF THE INITIAL EXPERIMENTS THAT USED A DIGITAL OPTICAL CAMERA TO DISTINGUISH THESE MARKS, EVEN AT EXTREME TEMPERATURES. THE OBJECTIVE OF PHASE II IS TO DESIGN, CONSTRUCT AND VERIFY AN INTEGRATED SYSTEM TO USE THE PROPOSED METHOD TO MEASURE STRAINS ON SAMPLES AT TEMPERATURES UP TO 4000 DEG F. TECHNICAL CONSIDERATIONS ARE DISCUSSED AND A DETAILED PROPOSAL FOR A WORKING SYSTEM IS PRESENTED. COST ESTIMATES IN SUPPORT OF A FIRM, FIXED-PRICE CONTRACT ARE GIVEN. BEYOND THE INTENDED PURPOSED OF ULTRA HIGH TEMPERATURE STRAIN MEASUREMENTS, GOVERNMENT AND PRIVATE APPLICATIONS OF THIS TECHNOLOGY ARE DISCUSSED. THE IMMEDIATE AND MOST IMPORTANT BENEFIT TO THE GOVERNMENT WILL BE AN ALTERNATIVE AND NOVEL METHOD TO MEASURE STRAIN AT ULTRA-HIGH TEMPERATURES.

THERMACOR TECHNOLOGY INC

2697 LAVERY CT - #9

NEWBURY PARK, CA 91320

CONTRACT NUMBER:

JACK G BITTERLY

TITLE:

TOPIC# 76

OFFICE: AMD/RDO

IDENT#: 20072

MODIFICATIONN AND MINIATURIZATION OF THERMACOR'S COOLING TECHNOLOGY IS PROPOSED IN ORDER TO PRODUCE A LIGHTWEIGHT BACKPACK VAPOR COMPRESSION PROTOTYPE WHICH CAN CONTINUALLY CYCLE FREON(TM) 114 THROUGH A THERMACOR COOLING GARMENT (ACTING AS THE EVAPORATOR IN A VAPOR COMPRESSION REFRIGERATION CYCLE). THE PROPOSED BACKPACK IS EXPECTED TO CYCLE R-114 AT FLOW RATES ADEQUATE TO FULLY BALANCE METABOLIC RATES OF 400 WATTS FOR MORE THAN 4 HOURS IN AMBIENT TEMPERATURES OF 120 DEG F. THE BACKPACK IS TO WEIGH LESS THAN 13 POUNDS AND MUST EMPLOY AN INTERNAL COMBUSTION ENGINE AS ITS PRIME MOVER. IN THE LATTER STAGES OF THE PROGRAM, TREADMILL TESTS WORKING WITH HUMAN SUBJECTS IN A CLIMATE CHAMBER ARE PROPOSED TO DETERMINE THE EFFICACY OF THIS DEVICE. THE PROTOTYPE DEVICE IS EXPECTED TO (a) PROVIDE MUCH BETTER COOLING PERFORMANCE, (b) BE SMALLER AND LIGHTERWEIGHT, AND (c) OPERATE AT FAR HIGHER EFFICIENCY LEVELS THAN ANY OTHER MAN-WORN DEVICE.

TOYON RESEARCH CORP

75 AERO CAMINO - STE A

GOLETA, CA 93117

CONTRACT NUMBER: F04701-87-C-0118

MICHAEL P GRACE

TITLE:

EFFECTIVENESS OF BISTATIC RADAR CONCEPTS FOR FINDING SRTs

TOPIC# 174

OFFICE: SD/SPO

IDENT#: 16570

SUBMITTED BY

THE SBIR PHASE I EFFORT FOCUSED ATTENTION ON THE SPACE-BASED RADAR'S ROLE IN DETECTING LOW-FLYING TARGETS IN DEFENSE OF CONUS OR IN NAVAL FLEET DEFENSE. IN THIS ROLE, THE PRINCIPAL ADVANTAGE OF THE HYBRID BISTATIC RADAR (HBR) OVER COMPETING CONCEPTS IN ECM RESISTANCE AS QUANTIFIED IN PHASE I. ANOTHER POTENTIAL ROLE IS FINDING AND ATTACKING STRATEGIC RELOCATABLE TARGETS (SRTs) WITHIN THE SOVIET UNION. FOR THIS MISSION, A STRATEGIC BOMBER BECOMES THE HBR RECEIVER AS WELL AS ATTACKER. BESIDES THE ECM ADVANTAGE, THE BOMBER WOULD ALSO BENEFIT FROM ENHANCED SURVIVABILITY BY USING ITS "SILENT" RADAR. IN PHASE II, TOYON PROPOSES TO EXPAND ITS STUDY OF THE HBR'S BENEFITS IN AREA SURVEILLANCE AND TO CONCENTRATE ON DEVELOPING HBR CONCEPTS TO LOCATE SRTs. THE PROPOSED EFFORT WILL EXAMINE A CONCEPT WHICH UTILIZES A SPACE-BASED RADAR OPERATING MONOSTATICALLY IN PEACETIME AND TRANSITIONING TO THE ROLE OF ILLUMINATOR FOR A PENETRATING BOMBER DURING TRANS/POST-SIOP. THE CONCEPT ALSO INCLUDES RECONSTITUTING SATELLITE ASSETS LOST AT THE ONSET OF WAR WITH SMALL, LIGHTWEIGHT SATELLITE TRANSMITTERS ("SMALL-SATS") PLACED INTO VERY LOW ORBIT BY ICBMs.

TRANSDUCER RESEARCH INC
1228 OLYMPUS DR
NAPERVILLE, IL 60540
CONTRACT NUMBER:
JOSEPH R STETTER
TITLE:
A MICROCHEMICAL DETECTION AND ALERTING SYSTEM
TOPIC# 79 OFFICE: AMD/RDO IDENT#: 20073

DURING PHASE I SEVERAL NOVEL ELECTROCATALYST ALLOYS AND MICROFABRICATION PROCEDURES WERE USED IN THE DESIGN AND CONSTRUCTION OF CHRONOAMPEROMETRIC SENSORS. THESE DETECTORS EXHIBITED SEVERAL HUNDRED TIMES BETTER S/N THAN ANY PREVIOUSLY REPORTED MINIATURE DETECTOR. THE AUXILLARY SYSTEMS, U-COMPUTER SYSTEM, U-POTENTIOSTAT, AND RELATED SYSTEMS WERE INTERFACED TO THE NEW SENSOR SUCCESSFULLY. THE DATA GATHERED WITH THE DETECTORS AND AUXILLARY SYSTEMS DEMONSTRATED THE FEASIBILITY OF THE APPROACH, AND, EVEN MORE IMPORTANTLY, THEY ILLUSTRATED THE SYSTEM PERFORMANCE TO BE SEVERAL ORDERS OF MAGNITUDE MORE SENSITIVE THAN EXISTING SYSTEMS. PHASE II IS FOCUSED

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ON THE CONSTRUCTION AND DELIVERY OF IMPROVED PROTOTYPE DETECTION AND
ALARM SYSTEMS TO THE USAF.

ULTRAMET
12173 MONTAGUE ST
PACOIMA, CA 91331
CONTRACT NUMBER: 19628-87-C-0166
DR JOHN T HARDING
TITLE:
REFRACTORY ULTRASTRUCTURES BY CVD
TOPIC# 48 OFFICE: RADC/XPX IDENT#: 16210

AN ULTRASTRUCTURE IS A COMPOSITIONALLY MODULATED PERIODIC STRUCTURE
CONSISTING OF ALTERNATING THIN LAYERS OF TWO MATERIALS. THE THICKNESS
OF EACH LAYER IS LESS THAN THE ELECTRON MEAN FREE PATH, NO MORE THAN
A FEW HUNDRED ATOMS THICK. ULTRASTRUCTURES ALSO ARE KNOWN AS MULTI-
QUANTUM WELL MATERIALS, SUPERLATTICES, NANOMETER COMPOSITES, AND
NANOMETER MODULATED STRUCTURES. THEY POSSESS EXTRAORDINARY
ANISOTROPIC ELECTRONIC, OPTICAL, THERMAL, AND MECHANICAL PROPERTIES,
QUITE DIFFERENT FROM THOSE OF EITHER CONSTITUENT. IN THIS PHASE II
PROGRAM, ULTRAMET PROPOSES TO INVESTIGATE TECHNIQUES FOR FABRICATING
THICK (0.3 mm) SAMPLES OF REFRACTORY ULTRASTRUCTURES IN ORDER TO
CHARACTERIZE HIGH TEMPERATURE STRENGTH, DUCTILITY, OXIDATION
RESISTANCE, AND THERMAL AND ELECTRICAL CONDUCTIVITY, PARTICULARLY
ROOM TEMPERATURE SUPERCONDUCTIVITY. CHEMICAL VAPOR DEPOSITION (CVD)
IS THE MOST PROMISING FABRICATION PROCESS BECAUSE OF ITS RAPID
DEPOSITION RATE. IN PHASE I, SPECIMENS UP TO 0.2 mm THICKNESS,
CONSISTING OF OVER 300 PERIODS, WERE FABRICATED AND ANALYZED USING
Nb/NbN AND Ti/TiB AS THE CONSTITUENTS. IN PHASE II, OTHER
CONSTITUENTS WILL BE TRIED, AS WELL AS NEW PROCESSES FOR REDUCING
LAYER THICKNESS INTO THE NANOMETER DOMAIN.

ULTRAMET
12173 MONTAGUE ST
PACOIMA, CA 91331
CONTRACT NUMBER: 19628-87-C-0144
RICHARD B KAPLAN
TITLE:
BORON NITRIDE COATINGS FOR GROUP III-V CRYSTAL GROWTH
CONTAINMENT
TOPIC# 54 OFFICE: RADC/XPX IDENT#: 16215

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THE GROUP III-V SEMICONDUCTORS RECENTLY HAVE RECEIVED A GREAT DEAL OF ATTENTION FOR THEIR POTENTIAL FOR USE IN INFORMATION EXCHANGE, LARGELY DUE TO THE FACT THAT THEIR ELECTRON MOBILITIES ARE FIVE TO TEN TIMES GREATER THAN THAT OF SILICON. THE MELTS FOR DRAWING THE CRYSTALS OF THESE MATERIALS ARE HELD EXCLUSIVELY IN BORON NITRIDE (BN) CONTAINMENT. THE DEVELOPMENT OF A PROCESS FOR PRODUCING BN-COATED GLASSWARE WILL REDUCE GREATLY THE COST OF CONTAINMENT FOR DRAWING SINGLE CRYSTALS OF THE III-V ALLOYS, AS STATE-OF-THE-ART SYSTEMS, REQUIRING HOT PRESSING DURING FABRICATION, ARE VARY EXPENSIVE. IN THIS PHASE II PROGRAM, ULTRAMET PROPOSES TO DEVELOP A PROCESS FOR DEPOSITING BN ON QUARTZ TUBING BY CHEMICAL VAPOR DEPOSITION (CVD), AND DETERMINE THE DESIGN AND ECONOMICS DATA NEEDED FOR SCALING UP TO COST, EFFECTIVE, HIGH-OUTPUT PRODUCTION. THE DEPOSITION PROCESS WILL BE OPTIMIZED; A FEASIBILITY STUDY FOR PRODUCING BN-COATED QUARTZ TUBING WILL BE COMPLETED; AND A DETAILED ENGINEERING DESIGN FOR PRODUCTION FACILITIES WILL BE CREATED.

UNIVERSAL ENERGY SYSTEMS INC
4401 DAYTON-XENIA RD
DAYTON, OH 45432
CONTRACT NUMBER: F33615-89-C-5709
JAY RAMANATHAN
TITLE:

KNOWLEDGE-BASED ASSISTANCE FOR CONTROL AND USE OF MANUFACTURING
SOFTWARE SYSTEMS: OBJECT-BASED INTEGRATED DESIGN (OBID)
TOPIC# 107 OFFICE: AFWAL/ML IDENT#: 16657

IN 1985, SOFTWARE COSTS TOTALED ROUGHLY 11 BILLION DOLLARS IN THE U.S. DEPARTMENT OF DEFENSE. THE SOFTWARE COSTS ARE GREAT BECAUSE THE DEMAND FOR SOFTWARE IS INCREASING; THE DEMAND FOR SOFTWARE IS INCREASING BECAUSE OF THE GREATER EMPHASIS ON END-USER PRODUCTIVITY. THE PROPOSED OBID(TM) (OBJECT-BASED INTEGRATED DESIGN) WORKSTATION PRODUCT WILL ADDRESS THIS PROBLEM BY MAKING IT MUCH LESS EXPENSIVE TO GENERATE APPLICATIONS WHICH REQUIRE THE USE OF MULTIPLE EXISTING SOFTWARE PACKAGES RUNNING ON DIFFERENT COMPUTER SYSTEMS.

UNIVERSAL TECHNOLOGY CORP (UTC)
1270 N FAIRFIELD RD
DAYTON, OH 45432
CONTRACT NUMBER: F33615-89-C-5701
WILLIAM M HENGHOLD
TITLE:

LOW COST UNIFIED EXPERT SYSTEM TOOL FOR MANUFACTURING
TOPIC# 108 OFFICE: AFWAL/ML IDENT#: 16662

SUBMITTED BY

THE POSITIVE IMPACT OF EXPERT SYSTEMS UPON MANUFACTURING CAN BE HEIGHTENED BY ELIMINATION OF SOME OF THE IMPEDIMENTS OF THE KNOWLEDGE ENGINEERING PROCESS. THE PROPOSED EFFECT CONTINUES THE DEVELOPMENT OF UNIFIED (ACQUISITION, REFINEMENT AND DELIVERY) EXPERT SYSTEM TOOL. THE PHASE I EFFORT DEMONSTRATED THE FEASIBILITY OF USING LOW COST PERSONAL COMPUTERS AND COGNITIVE PSYCHOLOGY TO ELIMINATE SOME OF THE KNOWLEDGE ENGINEERING IMPEDIMENTS. THE CONTINUING EFFORT FOCUSES ON THE KNOWLEDGE REFINEMENT AND DELIVERY ASPECTS OF TOOL DEVELOPMENT. DEVELOPMENT AND TESTING OF THE TOOL WILL REVEAL A VARIETY OF ISSUES. THESE ISSUES WILL BE EVALUATED FOR NEAR OR LONG TERM RESOLUTION. NEAR TERM SOLUTIONS WILL BE IMPLEMENTED IN THE PHASE II PRODUCT AND LONG TERM ISSUES RESOLVED IN PHASE III FOLLOW ON EFFORTS. A COMPLETE TOOL WILL BE PUT TO BOTH ALPHA AND BETA TESTING IN PREPARATION FOR DEVELOPMENT OF DOD AND COMMERCIAL PRODUCTS.

VISTA RESEARCH INC
PO BOX 998 - 100 VIEW ST
MOUNTAIN VIEW, CA 94042
CONTRACT NUMBER:
DR ALAN A BURNS
TITLE:
PLASMA SHEATH MEASUREMENT FOR HYPERVELOCITY MODELS
TOPIC# 214 OFFICE: BMO/MYSC IDENT#: 21028

THE NOVEL AND INNOVATIVE TECHNIQUE EMPLOYS ON-BOARD HARMONIC FREQUENCY GENERATION TO PROVIDE RF SIGNALS THAT CAN BE USED TO MEASURE ELECTRON DENSITIES IN THE LAMINAR AND TURBULENT BOUNDARY LAYERS ON A HYPERSONIC MODEL. THE ONLY ON-BOARD COMPONENTS ARE TWO MICROWAVE DIODES FOR HARMONIC GENERATION. EXCITING SIGNALS ARE SUPPLIED BY RF SOURCES ILLUMINATING THE MODEL.

XON-TECH INC
6862 HAYVENHURST AVE
VAN NUYS, CA 91406
CONTRACT NUMBER:
GEORGE E BOHANNON
TITLE:
MODULATED PATCH SCATTERER ANTISIMULATION DEVICES
TOPIC# 218 OFFICE: BMO/MYSC IDENT#: 16770

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THIS PROPOSAL PERTAINS TO THE DEVELOPMENT AND ANALYSIS OF A RADAR SCATTERING DEVICE WHICH IS TO BE USED ON REENTRY VEHICLES AND/OR DECOYS TO IMPROVE THE REENTRY VEHICLE (RV) PENETRATION OF DEFENSE SYSTEMS. THE DEVICE IS A RESONANT CAVITY-BACKED SLOT WHOSE RCS, PHASE, AND RESONANCE FREQUENCY ARE ELECTRONICALLY CONTROLLED. THIS DEVICE WILL RENDER IT DIFFICULT OR IMPOSSIBLE FOR A DEFENSE RADAR TO USE COHERENT PROCESSING TECHNIQUES SUCH AS COHERENT DOPPLER OR PHASE DERIVED RANGE TO EXTRACT SMALL SCALE MOTION SIGNATURES FROM THE RADAR DATA. THE DEVICES WILL ALSO IMPROVE THE RV-DECOY DYNAMIC RCS MATCH. THE PROPOSAL ENCOMPASSES THE DESIGN, CONSTRUCTION, AND TESTING OF THE SCATTERING DEVICE. ALSO INCLUDED IS THE ANALYSIS OF THE EFFECTIVENESS OF THE DEVICE FOR DENYING DISCRIMINATION.

AF

TOTAL NUMBER OF AWARDS: 136

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AMPARO CORP
PO BOX 2687
SANTA FE, NM 87504
CONTRACT NUMBER:
JAMES J WALKER
TITLE:
STAND-OFF MINE DETECTOR
TOPIC# 25a OFFICE: TALRPO IDENT#: 19024

THIS DOCUMENT PROPOSES A CONTINUATION OF WORK FUNDED IN PHASE I TO INVESTIGATE THE APPLICATION OF NEUTRON INDUCED PROMPT GAMMA RAY ANALYSIS (PGA) TO THE PROBLEM OF DETECTING LAND MINES. A PROGRAM IS PRESENTED WHICH INCLUDES DETAILED NEUTRON AND GAMMA RAY TRANSPORT CALCULATIONS, SPECIFICATION OF NEUTRON SOURCE REQUIREMENTS, CALCULATION OF GAMMA RAY DETECTOR RESPONSE, FABRICATION OF A PROTOTYPE SYSTEM, DEVELOPMENT OF SOPHISTICATED DATA ANALYSIS PROCEDURES, SPECIFICATION OF PROOF-OF-PRINCIPLE EXPERIMENTS AND THE DESIGN OF A FIELDABLE DETECTION UNIT. THIS PROGRAM WILL ACCOMPLISH AN IN DEPTH RE-EXAMINATION OF PGA USING MODERN TECHNOLOGY AND IF SUCCESSFUL, RESULT IN A SYSTEM FOR FIELD APPLICATION.

CHIRP CORP
8248 SUGARMAN DR
LA JOLLA, CA 92037
CONTRACT NUMBER:
DR RICHARD A ATLES
TITLE:
INTERFERENCE REJECTION AND ROBUST PATTERN RECOGNITION WITH NEURAL NETWORKS
TOPIC# 12a OFFICE: TALRPO IDENT#: 19001

ANALOG NEURAL NETWORKS WITH HIGH PROCESSING SPEED CAN BE MICRO-MINIATURIZED WITH VLSI TECHNIQUES. THEY CAN THUS BE DEPLOYED IN SYSTEMS WITH SIZE, WEIGHT, AND PROCESSING TIME CONSTRAINTS. IN MANY DOD APPLICATIONS, SUCH SYSTEMS MUST COPE WITH INTERFERENCE (E.G., JAMMING) AS WELL AS DIFFICULT SIGNAL/TARGET RECOGNITION PROBLEMS THAT ARE CONFOUNDED BY NUISANCE VARIABLES (E.G., RANGE, VIEWING POSITION, AND BACKGROUND IN OBJECT RECOGNITION). CAN NEURAL NETWORKS BE USED

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FOR INTERFERENCE REJECTION AND ROBUST PATTERN RECOGNITION, E.G.,
SIGNAL/TARGET RECOGNITION THAT CAN FUNCTION DESPITE VARIABLE NUISANCE
PARAMETERS? INTERFERENCE REJECTION CAN BE ACHIEVED BY OPTIMUM PARA-
METER ESTIMATION WITH A HOPFIELD NEURAL NETWORK (A NEW RESULT).
ROBUST PATTERN RECOGNITION CAN BE OBTAINED WITH A NEURAL-SEMANTIC NET
THAT SOLVES FOR SIGNAL/TARGET IDENTIFICATION AND NUISANCE VARIABLES
ALL-AT-ONCE. THIS MASSIVELY PARALLEL APPROACH EXPLOITS POWERFUL
INTERDEPENDENT FEATURES THAT CANNOT BE USED WITH OTHER METHODS.

CONCEPT ENGINEERING

PO BOX 786

CONWAY, WA 98238

CONTRACT NUMBER:

JOHN A WEBSTER

TITLE:

STEREOSCOPIC FULL FIELD OF VISION REAL TIME VIDEO SYSTEM

PRODUCING VISUAL TELEPRESENCE FOR THE OPERATION OF RPVs

TOPIC# 3a OFFICE: TALRPO IDENT#: 18981

THIS PROPOSED PHASE II EFFORT WILL DESIGN AND BUILD A STEREOSCOPIC
VIDEO TELEPRESENCE SYSTEM TO OPERATIONALLY TEST THE CONCEPT PROVEN
IN PHASE I. THIS SYSTEM WILL USE STATE OF THE ART OPTICAL AND VIDEO
TECHNOLOGY. THE EFFORT WILL PRODUCE A VISION SYSTEM THAT TRANSMITS
THE HUMAN VISUAL EXPERIENCE FROM A REMOTE SITE TO THE OPERATOR
THROUGH THE USE OF VIDEO TECHNOLOGY. THIS SYSTEM WILL BE USEABLE ON
A DESIGNATED TEST BED DEVICE. THE SYSTEM WILL SUBSTITUTE A REMOTE
HIGH RESOLUTION VIDEO SENSOR EQUIPPED WITH AN EXTREMELY WIDE ANGLE
LENS AND HEAD MOTION FOLLOWING CAPABILITY FOR THE OPERATOR'S EYES.
THE OPERATOR WILL PERCEIVE AN ENTIRE NORMAL VISUAL REALITY FROM THE
SENSORS, THROUGH THE VIDEO SYSTEM, PROJECTED ON CURVED STEREO VIEWING
SCREENS MOUNTED IN A HELMET. THIS WILL ALLOW THE VIEWER TO OPERATE A
REMOTELY PILOTED VEHICLE AS IF HE WERE IN IT. THE SYSTEM WILL BE
DESIGNED IN A MODULAR FASHION TO ALLOW FOR DIFFERENT TEST BED USES.
THIS MODULAR DESIGN WILL ALSO ALLOW FOR EASY UPGRADES OF THE SYSTEM
AS VIDEO TECHNOLOGY ADVANCES.

FLOW RESEARCH CO

21414 - 68TH AVE S

KENT, WA 98032

CONTRACT NUMBER:

SURESH MENON

TITLE:

INNOVATIVE SCRAMJET FLAMEHOLDERS FOR ENHANCED MIXING

TOPIC# 5a OFFICE: TALRPO IDENT#: 18986

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THE DEVELOPMENT OF FUTURE SPACE TRANSPORTATION SYSTEMS INVOLVES THE APPLICATION OF A NEW PROPULSION SYSTEM KNOWN AS THE SUPERSONIC COMBUSTION RAMJET (SCRAMJET). FOR EFFICIENT COMBUSTION IN THIS ENGINE, IT IS ESSENTIAL THAT MIXING BETWEEN THE INJECTED FUEL AND THE INCOMING SUPERSONIC AIR STREAM OCCURS EFFICIENTLY. HOWEVER, PREVIOUS THEORETICAL AND EXPERIMENTAL IN INVESTIGATIONS OF SUPERSONIC MIXING FLOWS INDICATE THAT SUPERSONIC SHEAR FLOWS ARE VERY STABLE, WITH THE MIXING DECREASING WITH INCREASES IN THE FLOW MACH NUMBER. IN THE RECENT PHASE I STUDY FOR THIS PROJECT, EXPERIMENTAL EVIDENCE WAS OBTAINED THAT INDICATES IT MAY BE POSSIBLE TO ENHANCE MIXING IN SUPERSONIC FLOWS BY USING A THREE-DIMENSIONAL FLAMEHOLDER CONFIGURATION. THE PROPOSED PHASE II STUDY WILL FURTHER EVALUATE EXPERIMENTALLY THE ENHANCEMENT OF FUEL-AIR MIXING BEHIND THREE-DIMENSIONAL FLAMEHOLDERS. THIS WOULD RESULT IN THE DEVELOPMENT OF A FLAMEHOLDER CONFIGURATION THAT MAY HAVE PRACTICAL APPLICATIONS FOR THE SUCCESSFUL DEPLOYMENT OF THE SCRAMJET ENGINE. PHASE II IS FUNDED BY THE DEPARTMENT OF AIR FORCE (AFSC/NAT).

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
JOHN W HALECKI
TITLE:
TELEOPERATED MINE DETECTION VEHICLE (TMDV)
TOPIC# 25a OFFICE: TALRPO IDENT#: 19025

THE TMDV PROGRAM WILL RESULT IN THE DEVELOPMENT OF A PROTOTYPE TELEOPERATED VEHICLE THAT CAN BE: FURTHER REFINED AS A BASELINE MINE DETECTION VEHICLE; USED AS A TEST PLATFORM FOR NEWLY DEVELOPED SENSORS; USED AS A SEMI-SACRIFICIAL PLATFORM TO EVALUATE "DETECTION BY DETONATION" TECHNIQUES BECAUSE OF ITS LOW COST. DEVELOPMENT WILL RESULT IN A "GIANT STEP" IN COUNTERMINE OPERATIONS TECHNOLOGY.

NIELSEN ENGINEERING & RESEARCH INC
510 CLYDE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER:
ROBERT E CHILDS
TITLE:
AERODYNAMIC PREDICTION FOR STOVL AIRCRAFT IN GROUND EFFECT
TOPIC# 1a OFFICE: TALRPO IDENT#: 18978

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NUMERICAL PREDICTION METHODS FOR GROUND EFFECTS FLOWS HAVE POOR ACCURACY, IN LARGE PART, BECAUSE OF INADEQUATE TURBULENCE MODELING. IN PHASE I, DATA FROM A NUMERICAL SIMULATION OF TURBULENCE IN THE UPWASH FOUNTAIN WAS USED TO DETERMINE SPECIFIC ERRORS IN THE k-e MODEL AND TO DEVISE CORRECTIONS. MODELS FOR GROUND EFFECTS FLOWS MUST ACCOUNT FOR EFFECTS OF ANISOTROPY, STREAMLINE CURVATURE, AND LARGE SCALE MIXING. MANY OF THESE ERRORS CAN BE RECTIFIED WITH THE REYNOLDS-STRESS TRANSPORT MODEL (RSTM), SINCE IT RESOLVES TURBULENCE PHENOMENA WHICH ARE CRITICAL TO PREDICTION ACCURACY. THE RSTM WILL BE STUDIED IN PHASE II. TURBULENCE SIMULATION DATA WILL BE USED TO OPTIMIZE THE RSTM FOR GROUND EFFECTS FLOWS. COMPUTATIONAL COST AND ACCEPTANCE BY THE AERODYNAMICS COMMUNITY DICTATE THAT A RELATIVELY INEXPENSIVE MODEL BE AVAILABLE, BUT SOME APPLICATIONS DEMAND HIGH ACCURACY. BOTH THE MODIFIED k-e MODEL AND THE RSTM WILL BE AVAILABLE IN A CODE FOR PREDICTING GROUND EFFECTS FLOWS. INFORMATION FROM THE RSTM WILL BE EMPLOYED TO IMPROVE THE ACCURACY AND GENERALITY OF THE k-e MODEL. THE PREDICTION METHOD FOR THE IMPINGING JET REGION WILL BE COMBINED WITH AN EULER METHOD CAPABLE OF PREDICTING FLOW ABOUT AN AIRCRAFT TO PROVIDE A TOTAL ANALYSIS CAPABILITY.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE B
TORRANCE, CA 90505

CONTRACT NUMBER:
DR THOMASZ JANNSON

TITLE:

VLSI OPTICAL INTERCONNECTS BASED ON MULTIPLEX BRAGG PLANAR
HOLOGRAPHY

TOPIC# 11a OFFICE: TALRPO IDENT#: 19000

VLSI OPTICAL INTERCONNECTS BASED ON MULTIPLEX BRAGG HOLOGRAPHY HAVE BEEN INVESTIGATED IN PHASE I AS A UNIQUE APPROACH TO THE PROBLEM OF HIGHLY-PARALLEL AND HIGHLY-EFFICIENT VLSI BOARD-TO-BOARD AND CHIP-TO-CHIP OPTICAL INTERCONNECTS. DUE TO THE MUCH HIGHER BRAGG LENGTH OF INTERACTION, THE INTERCONNECTABILITY OF POC'S OPTICAL PLANAR INTERCONNECTS IS EXTREMELY HIGH (.10 TO THE 4TH POWER FAN-OUT VERSUS 3~20 FOR CONVENTIONAL 3D HOLOGRAPHIC INTERCONNECTS), AND THEIR INSERTION LOSSES ARE EXCEPTIONALLY LOW (<1dB). IN ADDITION, DUE TO PLANAR AND

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"MICRO-ELECTRONIC" TOPOLOGY, POC'S HOLOGRAPHIC INTERCONNECTS ARE HIGHLY-STABLE, COMPACT, RUGGED AND NICELY COMPATIBLE TO THE VLSI ELECTRONIC SYSTEMS. BASIC PHASE I RESULTS ARE SUCCESSFUL EXPERIMENTAL DEMONSTRATION OF: (1) 1-TO-6 (TRANSMISSION AND REFLECTION) AND 1-TO-9 (TRANSMISSION) FAN-OUT INTERCONNECTS WITH 1dB-LOSSES PER CHANNEL, (2) MANY-TO-MANY (2-TO-5) CHANNEL INTERCONNECTS WITH 1dB-LOSSES AND -20dB-CROSS-TALK, (3) CASCADE INTERCONNECTS, (4) HIGHLY-EFFICIENT (>80%) TIR HOLOGRAPHIC COUPLERS, AND (5) RECONFIGURABLE (DYNAMIC) PLANAR HOLOGRAPHIC INTERCONNECTS. THE BASIC GOAL OF PHASE II IS TO DEMONSTRATE HIGHLY-EFFICIENT (<1dB) AND HIGHLY-PARALLEL 2D/3D BOARD-TO-BOARD INTERCONNECTS BASED ON MULTI-MODE PLANAR HOLOGRAPHIC TECHNOLOGY.

PROGRAMMED COMPOSITES INC

380 CLIFFWOOD PK

BREA, CA 92621

CONTRACT NUMBER:

L BRIAN KELLER

TITLE:

AUTOMATIC COMPUTER CONTROLLED PROCESSING OF ADVANCED COMPOSITES

TOPIC# 10a OFFICE: TALPRO IDENT#: 18997

AUTOMATIC, COMPUTER CONTROLLED, PROCESSING OF SEVERAL "DIFFICULT TO PROCESS" ADVANCED COMPOSITES WILL BE DEMONSTRATED WITH PRODUCTION EQUIPMENT. A TYPICAL PRIMARY AIRCRAFT STRUCTURE WILL BE MADE FROM THREE TYPES OF COMPOSITES; A POLYIMIDE, A HIGH TEMPERATURE THERMO-PLASTIC AND A CARBON/CARBON PRECURSOR. A SUFFICIENT NUMBER OF PARTS WILL BE MADE WITH COMPUTER CONTROL TO PROVE CONSISTENT AND ECONOMICAL PRODUCTION CAPABILITY. AN ECONOMIC ASSESSMENT OF THE IMPACT OF THIS "HANDS OFF" COMPUTER CONTROL WILL BE PERFORMED. THE "INTELLIGENT", FEEDBACK CONTROL SYSTEM WILL BE BASED UPON RESPONSES FROM DIE-ELECTRIC MONITORS WHICH DETECT CHANGES OCCURING THROUGH THE ENTIRE THICKNESS OF THE LAMINATE. IN PHASE I, EXCELLENT CORRELATION OF THE DIELECTRIC RESPONSE FROM A RES-CAP TM SYSTEM WITH SIGNIFICANT PROCESS EVENTS WAS OBTAINED. IN PHASE II, AN INTERACTIVE COMPUTER PROGRAM WILL BE DEVELOPED TO AUTOMATICALLY CONTROL AN AUTOCLAVE (OR OTHER PROCESS EQUIPMENT) SO THAT THE OPTIMUM PROCESS CYCLE IS ALWAYS PERFORMED IN SPITE OF BATCH TO BATCH MATERIAL VARIATION. THE PROGRAM WILL BE BASED UPON IDEAL PROCESS CURVES DEVELOPED FOR EACH COMPOSITE

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SYSTEM. A PRODUCTION AUTOCLAVE WILL BE MODIFIED FOR AUTOMATIC CONTROL AND THE SYSTEM WILL BE PROVED. COMMERCIAL EQUIPMENT AND COMPREHENSIVE OPERATING PROCEDURES WILL BE DEFINED AND DESCRIBED.

SCIENCE RESEARCH LAB INC
15 WARD ST
SOMERVILLE, MA 02143
CONTRACT NUMBER:

DANIEL BIRX

TITLE:

COMPACT ACCELERATOR DESIGN BASED ON A CYCLIC INDUCTION
ACCELERATOR WITH BRANCHED MAGNETICS

TOPIC# 9a OFFICE: TALRPO IDENT#: 18995

CURRENT DESIGNS FOR HIGH CURRENT (10-100kA) ACCELERATORS ARE BASED ON LINEAR OPERATING GRADIENTS OF AT BEST 1-2 MeV/METER. IN FERRO- (FERRO) MAGNETIC INDUCTION ACCELERATORS, THESE LOW GRADIENTS ARE IMPOSED BY THE PROPERTIES OF THE MATERIAL WHICH COMPRISES THE CORE. WITH AIR CORE RADIAL LINE INDUCTION LINACS, THE CONSTRAINTS IS DERIVED FROM THE GEOMETRY OF THE RADIAL LINES AND THE DIELECTRIC BREAKDOWN STRENGTH. SIGNIFICANT REDUCTIONS IN THE SIZE AND WEIGHT OF INDUCTION LINACS WILL HAVE A CONSIDERABLE IMPACT ON THE COST EFFECTIVENESS AND MILITARY UTILITY OF INDUCTION ACCELERATORS FOR CHARGED PARTICLE BEAM WEAPON (CPBW) APPLICATIONS. THE USE OF BRANCH MAGNETIC TECHNOLOGY MAY MAKE POSSIBLE THE DESIGN OF HIGH CURRENT RECIRCULATING INDUCTION LINACS WITH SIZE REDUCTIONS OF A FEW ORDERS OF MAGNITUDE. OUR GOAL WOULD BE TO DESIGN A PROOF-OF-PRINCIPLE EXPERIMENT OUTLINING DESIGNS FOR THE BRANCHED MAGNETIC PULSE POWER DEVICE. THIS INVESTIGATION WILL LEAD TO A TECHNICAL BASIS FOR THE ACCELERATOR GAP AND ELECTRON TRANSPORT SYSTEM DESIGN FOR A SPIRAL LINE RECIRCULATING LINACE.

SPEECH SYSTEMS INC
18356 OXNARD ST
TARZANA, CA 91356
CONTRACT NUMBER: DAAH01-87-C-8953

DR PHIL SHINN

TITLE:

SPEECH REPRESENTATION AND SPEECH UNDERSTANDING

TOPIC# 17a OFFICE: TALRPO IDENT#: 19012

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THIS STUDY ADDRESSES THE ISSUE OF DECOUPLING SPEECH AND NON-SPEECH KNOWLEDGE SOURCES TO ALLOW MORE EFFICIENT DEVELOPMENT OF SPEECH UNDERSTANDING SYSTEMS. RESEARCH AND DEVELOPMENT ARE PROPOSED TO IMPROVE THE ACCURACY AND EFFICIENCY OF A CONTINUOUS SPEECH, LARGE VOCABULARY SPEECH RECOGNITION SYSTEM AND TO PRODUCE BETTER KNOWLEDGE INTEGRATION TOOLS FOR APPLICATION DEVELOPERS. TO IMPROVE ACCURACY AND EFFICIENCY, SSI PROPOSES TO DEVELOP A MORE COMPACT SPEECH REPRESENTATION AND IMPROVE SEARCH STRATEGIES BY ANALYZING THE TYPES OF ERROR AND BY ANALYZING THE CURRENT LEXICAL REPRESENTATIONS. IN ORDER TO IMPROVE KNOWLEDGE INTEGRATION TOOLS DEVELOPMENT, WE WILL WORK WITH APPLICATION DEVELOPERS AT THE STANFORD UNIVERSITY KNOWLEDGE SYSTEMS LABORATORY AND OUTSIDE EXPERTS IN NATURAL LANGUAGE PROCESSING TO DETERMINE WHICH TOOLS AND SYSTEM ENHANCEMENTS WILL BEST AID APPLICATION DEVELOPERS AND MINIMIZE THEIR NEED TO BE KNOWLEDGEABLE IN SPEECH RECOGNITION. SSI PROPOSES TO DEVELOP A NUMBER OF TOOLS AND METHODOLOGIES TO ENHANCE INTEGRATION OF HIGHER-LEVEL KNOWLEDGE SOURCES IN THE SPEECH UNDERSTANDING PROBLEM, INCLUDING TEXT OUTPUT WITH EMBEDDED PARSING TAGS, PARTIAL PHRASE DECODING AND BETTER WORD SCORE NORMALIZATION.

TECHNOLOGY SYSTEMS INC
PO BOX 85
NORTH EDGECOMB, ME 04556

CONTRACT NUMBER:
CHARLES J BENTON

TITLE:

DEVELOPMENT OF A LOW COST SIMNET DISMOUNT SIMULATION SYSTEM

TOPIC# 30a OFFICE: TALRPO IDENT#: 19032

THE PHASE I EFFORT, TITLED "SPECIFICATION AND PERFORMANCE EVALUATION OF A LOW COST, NETWORKED, SIMULATION SYSTEM", FOCUSED UPON DEVELOPMENT OF LOW-COST, NETWORKABLE SIMULATION AND CIG CAPABILITIES. THE PHASE II EFFORT WILL PRODUCE AN OPERATIONAL PROTOTYPE SIMULATOR FOR USE ON THE SIMNET SYSTEM, WHICH IS A NETWORKED COMBINED ARMS SIMULATION ALLOWING FORCE-ON-FORCE TRAINING. THE SIMNET SYSTEM CURRENTLY HAS NO DISMOUNT CAPABILITY, AND THIS HAS VIRTUALLY ELIMINATED THE INFANTRY SOLDIER FROM THE SIMNET TRAINING ENVIRONMENT. THE PHASE I EFFORT ADDRESSED THE PROBLEMS OF IMPLEMENTING A DISMOUNT SIMULATOR,

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AND A RUDIMENTARY SYSTEM WAS IMPLEMENTED WHICH SHOWED THE PROPOSED TECHNIQUES TO BE BOTH VISUALLY EFFECTIVE AND TECHNICALLY FEASIBLE. THE PHASE II EFFORT AIMS TO EXPAND ON THE PHASE I RESULTS, WHICH INCLUDED AN ORDER OF MAGNITUDE IMPROVEMENT IN REAL-TIME CIG PERFORMANCE, A NEW TECHNIQUE (VISIBILITY MODULATION) TO SIMPLIFY INTER-NETWORK COMMUNICATIONS, AND DEVELOPMENT OF A NEW MAN-MACHINE INTERFACE.

WOOLLAM J A CO
2436 SHERIDAN BLVD
LINCOLN, NE 68502

CONTRACT NUMBER:

JOHN A WOOLLAM

TITLE:

MONOLAYER RESOLUTION CHARACTERIZATION BY VARIABLE ANGLE
SPECTROSCOPIC ELLIPSOMETRY (VASE)

TOPIC# 14a OFFICE: TALRPO IDENT#: 19008

IN THE PHASE I CONTRACT WE CLEARLY DEMONSTRATED THE APPLICABILITY OF VARIABLE ANGLE SPECTROSCOPIC ELLIPSOMETRY (VASE) FOR IN SITU MONITORING OF COMPOUND MULTILAYER SEMICONDUCTOR CRYSTAL GROWTH. THE PHASE II GOALS ARE TO BUILD AND TEST A VASE ATTACHED TO AN ACTUAL CRYSTAL GROWTH CHAMBER. SUFFICIENT EXPERIENCE WILL BE GAINED THAT FUTURE CRYSTAL GROWTH SYSTEMS CAN BE BOTH MONITORED AND CONTROLLED ELLIPSOMETRICALLY. THERE PRESENTLY EXISTS NO EFFECTIVE MONITOR OF IN SITU MOCVD GROWTH, AND HIGH ENERGY ELECTRON DIFFRACTION IS NOT COMPLETELY SATISFACTORY FOR MBE GROWTH, ESPECIALLY FOR GAS SOURCE MBE. THUS, ELLIPSOMETRY WILL FILL AN IMPORTANT GAP IN NATIONALLY AVAILABLE INSTRUMENTATION.

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INTELLIGENT SYSTEMS INTEGRATION INC
3801 EUBANK NE
ALBUQUERQUE, NM 87111
CONTRACT NUMBER: DNA001-88-C-0243
DR TIMOTHY J ROSS

TITLE:

DEVELOPMENT OF A DYNAMIC EULERIAN FINITE ELEMENT CODE FOR
TRANSIENT ANALYSIS: DELTA 3D
TOPIC# 1 OFFICE: DNA IDENT#: 15390

CURRENT NUMERICAL COMPUTATIONS TO DESCRIBE NUCLEAR GROUND SHOCK ENVIRONMENTS, NUCLEAR CRATER FORMATION, IMPACT DYNAMICS, AND PENETRATION MECHANISMS PRESENTLY EMPLOY EULERIAN-BASED FINITE DIFFERENCE CODES BECAUSE OF THEIR ABILITY TO MODEL THE VOLUME FLUX PHENOMENA IN TRACKING MATERIAL MOVEMENT THROUGH THE DISCRETIZED SPACE. THE FINITE DIFFERENCE CODES SUFFER IN COMPARISON TO FINITE ELEMENT CODES, HOWEVER, IN THEIR ABILITY TO TREAT IRREGULAR GEOMETRIES AND VARIATIONS IN BOTH MESH SIZE AND ELEMENT SHAPE AND THEY ARE NOT ECONOMICALLY FEASIBLE FOR LARGE 3D CALCULATIONS BECAUSE OF MEMORY AND COMPUTING TIME REQUIREMENTS. IN PHASE I THE INABILITY OF FINITE ELEMENT FORMULATIONS TO EXPLICITLY MODEL ADVECTION FOR MATERIALS WITH DEVIATORIC STRENGTH (I.E. SOLIDS) WAS OVERCOME THROUGH THE USE OF AN INTELLIGENT REGISTER SYSTEM. PHASE I RESULTS CLEARLY REVEALED THE CAPABILITIES OF THIS NEW CODE (DELTA) IN TERMS OF: (i) BETTER INTERPRETATION OF PHYSICS ON BOUNDARY CONDITIONS, (ii) EFFICIENT COMPUTATIONAL PROCESSING SPEED, AND (iii) POTENTIAL IMPROVEMENTS DUE TO VECTORIZED ENHANCEMENT. IN PHASE II THE COMPUTATION SPEED FOR DELTA3D WILL BE AT LEAST THREE TIMES FASTER THAN HULL3D FOR THE SAME SIZE PROBLEMS (SAME NUMBER OF ELEMENTS). IF THE MESH-SIZE SAVING (THE FINITE ELEMENT MESH-SIZE IS USUALLY ONE-TENTH OF THE FINITE DIFFERENCE MESH-SIZE FOR A COMMON 3D PROBLEM) IS INCLUDED IN THE COMPARISON, THEN DELTA3D WILL BE ABOUT THIRTY TIMES FASTER THAN HULL3D FOR THE SAME 3D PROBLEM. THESE EFFICIENCIES IN BOTH COMPUTER MEMORY AND PROCESSING COSTS WILL BE ADDITIONAL ASSETS TO THE MODELING FREEDOM AND PHYSICAL EXACTNESS OF THE FINITE ELEMENT METHOD. THE DELTA3D CODE REPRESENTS A MAJOR IMPROVEMENT IN THE COMPUTATIONAL STATE-OF-THE-ART.

QUAN-SCAN INC
77 N OAK KNOLL AVE - #114
PASADENA, CA 91101
CONTRACT NUMBER: DNA001-88-C-0298
DR PAUL E WEST

TITLE:

MICRO DIGITAL RECORDING MODULE FOR NUCLEAR WEAPONS TESTING
TOPIC# 3 OFFICE: DNA IDENT#: 15470

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THE DEFENSE NUCLEAR AGENCY SEEKS NEW INSTRUMENTATION USING ADVANCED TECHNOLOGY TO IMPROVE DATA COLLECTION WITH BETTER ACCURACY AT LOWER COST. LARGE AMOUNTS OF DATA MUST BE RECORDED TO CHARACTERIZE THE EFFECTS OF NUCLEAR WEAPONS TESTS. BUILDING UPON THE FAVORABLE RESULTS OF A FEASIBILITY STUDY AND ITS EXISTING CAPABILITIES IN MECHANICAL IMAGING SYSTEMS AND PIEZOELECTRIC CERAMICS TECHNOLOGY, QUAN-SCAN PROPOSES TO DESIGN, BUILD, AND TEST A LABORATORY PROTOTYPE MASS STORAGE SYSTEM BASED ON ENTIRELY NEW PRINCIPLES. THE PROPOSED EFFORT WILL FOCUS ON DESIGNING, BUILDING, INTEGRATING, AND TESTING SEVERAL KEY SUBSYSTEMS OF THE PROPOSED MASS STORAGE DEVICE. THE EFFORT WILL SUBSTANTIALLY INCREASE OUR CONFIDENCE IN THE ENGINEERING VIABILITY OF SUCH A MASS STORAGE SYSTEM AND IDENTIFY THE AREAS REQUIRING EFFORT TO ACHIEVE A COMMERCIALY VIABLE SUPER DENSE MASS STORAGE SYSTEM.

SCIENCE & ENGINEERING ASSOCS INC
PO BOX 3722
ALBUQUERQUE, NM 87190
CONTRACT NUMBER: DNA001-87-C-0239
DR EUGENE W SKLUZACEK

TITLE:
MEASURES OF EFFECTIVENESS FOR STRATEGIC RELOCATABLE TARGETS
TOPIC# 7 OFFICE: AM IDENT#: 15564

THIS PHASE II EFFORT WILL DEVELOP ANALYTICAL MODELS TO DESCRIBE BOMBER-SRT INTERACTIONS BY USE OF DIGITAL AREA LIMITATIONS DATABASES, THREAT DATA, AND TARGET ACQUISITION SENSOR MODELS. MODELS WILL BE SENSITIVE TO AIRCRAFT PERFORMANCE AND OPERATIONAL PARAMETERS AND WILL SUPPORT MAJOR INVESTMENT DECISIONS, FORCE STRUCTURE ANALYSIS, SENSOR COMPARISONS, AND DEVELOPMENT OF AUTOMATED ROUTE PLANNING SYSTEM REQUIREMENTS. ALTHOUGH A COMPLETELY AUTOMATED, SIOP-INTEGRATED, BOMBER-SRT MISSION PLANNING CAPABILITY IS SEVERAL YEARS IN THE FUTURE, OSD/JSRPS/SAC NEED THE CAPABILITIES OF THE PROPOSED MODELS NOW, TO PROVIDE A BASIS AND COMMON FRAMEWORK FOR PROBLEM UNDERSTANDING, MAKING INVESTMENT DECISIONS, AND ILLUMINATING PROBLEMS WHICH WILL OCCUR AS THE FULLY AUTOMATED PROCESS IS DEVELOPED. THE RESULT OF THIS PHASE II EFFORT WILL INCLUDE A DELIVERABLE PHASE I - WHICH HAS ALREADY ADVANCED THE STATE OF UNDERSTANDING OF THIS PROBLEM AREA - BY

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IDENTIFYING TOP LEVEL REQUIREMENTS FOR INTEGRATING SRTs INTO THE STRATEGIC PLANNING PROCESS, EVALUATING PLANNING CONSTRAINTS, DEVELOPING A HIGHLY REALISTIC BOMBER SEARCH MODEL, MAKING PRELIMINARY EVALUATIONS OF POTENTIAL CONTRIBUTIONS OF R&D PROGRAMS, AND DEMONSTRATING THE OVERALL MODEL. UNIQUE QUALIFICATIONS OF THE STAFF WILL CONTRIBUTE TO AND INSURE SUCCESSFUL COMPLETION, CULMINATING THEIR EFFORTS UNDER PHASE I.

UTD INC
8220 RUSSELL RD
ALEXANDRIA, VA 22309
CONTRACT NUMBER: DNA001-87-C-0214
DR EUGENE L FOSTER
TITLE:
TUNNEL HARDENING THROUGH INNOVATIVE ROCK BOLTS AND SHORTCRETE LINERS
TOPIC# 5 OFFICE: DNA IDENT#: 15537

ABSTRACT NOT AVAILABLE.

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TOTAL NUMBER OF AWARDS: 4

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ADROIT SYSTEMS INC
809 N ROYAL ST
ALEXANDRIA, VA 22314

CONTRACT NUMBER:

DAVID OBERG

TITLE:

DIRECTED ENERGY SYSTEM POINTING THROUGH GLOBAL POSITION
SYSTEM INTERFEROMETRY

TOPIC# 1 OFFICE: IDENT#: 200

IN THE PREVIOUS WORK PHASE, THE FEASIBILITY OF A GLOBAL POSITIONING SYSTEM (GPS) WAS DEMONSTRATED AND ACHIEVABLE POSITIONING ACCURACY LEVELS WERE DETERMINED. IN THE CURRENT RESEARCH EFFORT, A GPS INTERFEROMETRY-BASED PRECISION POINTING DEVICE IS BEING DEVELOPED. A RECEIVER IS BEING DESIGNED AND BUILT THAT CONSISTS OF A GPS RECEIVER THAT ACCEPTS THE GPS SIGNALS, EXTRACTS THE CARRIER WAVE, AND OBTAINS A COARSE MEASURE OF THE TIMING DELAY. AN INTERFEROMETER ALSO IS BEING DESIGNED AND BUILT THAT ACCEPTS THE CARRIER WAVES AND MEASURES THEIR PHASE DIFFERENCE SO THAT THE DIFFERENTIAL SIGNAL DELAY CAN BE PRECISELY MEASURED. A BREADBOARD IS BEING BUILT AND TESTED. A KALMAN FILTER ALSO IS BEING DEVELOPED FOR PROCESSING THE MEASUREMENTS INTO POINTING SOLUTIONS. WHEN SUCCESSFUL, THE RESULTING SENSOR WOULD BE ABLE TO SENSE THE ATTITUDE, OR POINTING DIRECTION, OF A DIRECTED ENERGY WEAPON OR ANY OTHER PLATFORM AS A STAND ALONE INSTRUMENT, WITHOUT ASSISTANCE FROM ANY OTHER NAVIGATIONAL DEVICES. THE GPS SENSOR WOULD PROVIDE PRECISE VEHICLE POSITION INFORMATION AS WELL.

ADVANCED MATERIALS CORP
4400 FIFTH AVE (c/o MELLON INSTITUTE)
PITTSBURGH, PA 15213

CONTRACT NUMBER:

S G SANKAR

TITLE:

LOW-COST LIGHTWEIGHT HIGH TORQUE MOTORS FOR APPLICATIONS OVER
A WIDE TEMPERATURE RANGE

TOPIC# 6 OFFICE: IDENT#: 401

HIGHER REMANENCE AND ENERGY PRODUCT OF A PERMANENT MAGNET RESULT IN

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A GREATER TORQUE-TO-WEIGHT RATIO OF AN ELECTROMECHANICAL DEVICE, SUCH AS A MOTOR, AN ACTUATOR, AND A SENSOR. THIS POTENTIALLY REDUCES THE WEIGHT OF THE SYSTEM AND INCREASES ITS EFFICIENCY AND RELIABILITY. IN PREVIOUS WORK, PERMANENT MAGNETS WERE FABRICATED FROM PrFeCoAlB THAT EXHIBIT OUTSTANDING MAGNETIC PROPERTIES AT LOW TEMPERATURES, SUPERIOR TO NdFeB AND SmCo MAGNETS. CORROSION RESISTANCE WAS IMPROVED BY THIN SURFACE COATING OF CUBIC BORON NITRIDE. IN THIS CURRENT INVESTIGATION, PrFeB DESIGN STUDIES ARE BEING EXECUTED ON HIGH PERFORMANCE DEVICES. THESE DEVICES INCLUDE BOTH CONTINUOUS AND LIMITED MOTION TYPES AS WELL AS SENSORS, WHICH MAY FORM AN INTEGRAL PART OF THE SYSTEM. PROTOTYPES OF BRUSHLESS MOTORS, LIMITED DISPLACEMENT ACTUATORS AND RELUCTANCE POSITION SENSORS EQUIPPED WITH PrFeCoAlB MAGNETS ARE BEING TESTED AND COMPARED WITH THOSE OF NdFeCoAlB MAGNETS AND THEIR PERFORMANCE IS BEING ASSESSED OVER THE EXTREMES OF TEMPERATURE TO WHICH THEY MAY BE EXPOSED IN PRACTICE.

ADVANCED RESEARCH & APPLICATIONS CORP

425 LAKESIDE DR

SUNNYVALE, CA 94086

CONTRACT NUMBER:

L J PALKUTI

TITLE:

RELIABILITY SIMULATOR FOR RADIATION-HARD MICROELECTRONICS

TOPIC# 14

OFFICE:

IDENT#: 276

IN THIS RESEARCH, UNIVERSAL CORRELATION BETWEEN HOT-CARRIER LIFETIME AND INTERFACE TRAPS INTRODUCED BY X-RAY RADIATION IS DEMONSTRATED. THIS TECHNIQUE ALLOWS A REAL-TIME RELIABILITY SIMULATION OF CHANNEL HOT-ELECTRON (CHE) DEGRADATION IN SUBMICRON CMOS VLSI DEVICES, USING WAFER LEVEL X-RAY EXPOSURE AND MEASUREMENT OF SUBSTRATE CURRENT RATHER THAN TRADITIONAL LONG TERM VOLTAGE STRESSING TESTS. THE SIMILARITY OF CHE AND RADIATION-INDUCED INTERFACE GENERATION ALLOWS THIS TECHNIQUE TO BE USED AS AN EFFECTIVE SIMULATION MONITOR FOR HOT-CARRIERS DEGRADATION THAT IS IDEALLY SUITED TO THE DEVELOPMENT OF RADIATION-HARD VLSI MICROELECTRONICS. THIS TECHNIQUE CAN RAPIDLY ADVANCE THE DEVELOPMENT OF VLSI CMOS DEVICES AT 0.5 MICRON FEATURE SIZES. CRITICAL COMMUNICATIONS, NAVIGATION, AND MILITARY ELECTRONIC DEVICES THAT CAN OPERATE IN SUCH HOSTILE ENVIRONMENTS CAN APPLY THIS

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TECHNIQUE IN DEVELOPMENT AND MANUFACTURING. PHASE I EFFORTS FUNDED
BY THE AIR FORCE.

APA OPTICS INC
2950 NE - 84TH LN
BLAINE, MN 55432
CONTRACT NUMBER:

DR M A KHAN

TITLE:

ATOMIC LAYER CHEMICAL VAPOR DEPOSITION OF AlGa_N FOR SOLAR
BLIND ULTRAVIOLET DETECTORS

TOPIC# 14

OFFICE:

IDENT#: 440

SINGLE CRYSTAL EPITAXIAL GROWTH OF AlGa_N PREVIOUSLY WAS DEMONSTRATED
AT TEMPERATURES AS LOW AS 750C USING THE ATOMIC LAYER EPITAXY
APPROACH. IN THIS INVESTIGATION, LOW CARRIER CONCENTRATION SINGLE
CRYSTAL EPITAXY LAYERS OF AlGa_N ARE BEING DEPOSITED USING THE ATOMIC
LAYER EPITAXY APPROACH. DIPHENYLHYDRAZZINE IS BEING USED AS THE
SOURCE OF NITROGEN ALONG WITH AN EXCIMER LASER TO IONIZE NITROGEN
OVER THE GROWTH SURFACE. THE QUALITY OF MATERIAL GROWTH IS BEING
DEMONSTRATED VIA AN ELECTROLUMINESCENT DEVICE OPERATING AT LOW
VOLTAGES. SUCH SOLID STATE TUNABLE EMITTERS DO NOT SEEM TO EXIST IN
THE ULTRAVIOLET (UV) SPECTRAL REGION. AlGa_N IS ALSO POTENTIALLY AN
EXTREMELY VALUABLE MATERIAL SYSTEM FOR SOLAR BLIND UV DETECTORS AND
UV PHOTOCATHODES. UV SENSING IS THE BASIS FOR SEVERAL DEFENSE AND
COMMERCIAL APPLICATIONS INCLUDING FLAME SENSING, MISSILE PLUME
DETECTION, AND UV SPECTROSCOPY. FLAME SENSING IS A KEY SAFETY
REQUIREMENT FOR ALL COMMERCIAL BOILER SYSTEMS AND INSTALLATIONS
DEALING WITH OIL AND GAS PRODUCTION.

APPLIED SCIENCES INC
PO BOX 186 - 800 LIVERMORE ST
YELLOW SPRINGS, OH 45387

CONTRACT NUMBER:

MAX L LAKE

TITLE:

NOVEL MATERIALS FOR ELECTROMAGNETIC RAILGUNS

TOPIC# 2

OFFICE:

IDENT#: 205

SUBMITTED BY

THIS PROGRAM HAS DEMONSTRATED THE FEASIBILITY OF FABRICATING COMPOSITE MATERIALS USING VAPOR GROWN CARBON FIBERS (VGCF) FOR USE IN CRITICAL COMPONENTS OF RAILGUNS. THE COMPOSITE IS HIGHLY CONDUCTIVE ELECTRICALLY, LIGHTWEIGHT, OF HIGH STRENGTH, AND HIGHLY THERMALLY CONDUCTIVE. BY USING INTERCALATION METHODS, THE MATERIAL CAN HAVE A SPECIFIC ELECTRICAL CONDUCTIVITY SEVERAL TIMES HIGHER THAN COPPER, AND ITS CONDUCTIVITY CONTROLLED DURING MANUFACTURE. THE PROJECT IS INVESTIGATING IMPROVEMENTS IN FIBER LAY-UP AND DENSIFICATION TECHNIQUES IN METAL MATRIX AND POLYMERIC MATRIX COMPOSITES, AND IS DEVELOPING QUALITY CONTROL AND SCALING LAWS FOR MASS PRODUCTION. IF SUCCESSFUL, THESE MATERIALS COULD HAVE APPLICATION IN MANY COMMERCIAL AND MILITARY PRODUCTS, INCLUDING: ELECTRICALLY CONDUCTIVE AIRCRAFT SKINS, THERMALLY MANAGED PC BOARDS, HIGH PERFORMANCE ELECTRIC MOTORS, ENGINE COMPONENTS, RFI/EMI PROTECTION SHIELDING, AND A HOST OF OTHER PRODUCTS REQUIRING HIGH STRENGTH AND HIGH ELECTRICAL AND THERMAL CONDUCTIVITY.

ASTROSYSTEMS INC (ASTROPOWER DIV)
30 LOVETT AVE
NEWARK, DE 19711
CONTRACT NUMBER:
JAMES B McNEELY
TITLE:

ELECTRONIC GaAs-ON-SILICON MATERIAL FOR ADVANCED HIGH-SPEED
OPTOELECTRONIC DEVICES

TOPIC# 14 OFFICE: IDENT#: 283

THE GROWTH OF DEVICE QUALITY GaAs ON SILICON HAS BEEN DEMONSTRATED IN AN EARLIER EFFORT, USING SELECTIVE LIQUID PHASE EPITAXIAL (SLPE) GROWTH TECHNOLOGY. IN THIS INVESTIGATION, SLPE TECHNOLOGY IS BEING APPLIED, OPTIMIZING GROWTH PARAMETERS AND USING SLPE TO GROW 3 INCH DIAMETER GaAs ON HIGH QUALITY SILICON SUBSTRATES. WAFERS SUITABLE FOR GaAs INTEGRATED CIRCUIT MANUFACTURING ARE BEING DEVELOPED, LEADING TO A PRODUCTION DESIGN OF 3 INCH DIAMETER GaAs ON SILICON. THE USE OF GaAs OFFERS A HIGH STANDARD OF STABILITY AND PERFORMANCE IN HIGHER SPEED INTEGRATED CIRCUITS. HETEROEPITAXIAL LAYERS OF GaAs ON SILICON USING SLPE WOULD PERMIT THE FABRICATION OF MINORITY CARRIER DEVICES AND ALLOW THE GROWTH OF THICK DEVICE LAYERS. IN FABRICATING

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LARGE AREA, DEVICE QUALITY GaAs ON SILICON, THIS RESEARCH, WHEN SUCCESSFUL, WILL LEAD TO ACHIEVING THE BENEFITS OF GaAs ON A ROBUST SUBSTRATE. FABRICATION OF MONOLITHIC MICROWAVE INTEGRATED CIRCUITS ONTO HETEROEPITAXIAL GaAs ON SILICON WOULD OFFER INCREASED POTENTIAL FOR WEIGHT REDUCTION AND LOWER COSTS, IN ADDITION TO GREATER SPEED AND RELATIVE RADIATION IMMUNITY ON HOMOEPITAXIAL GaAs. GROWTH OF DEVICE QUALITY, LARGE AREA, GaAs EPITAXIAL LAYERS ON SILICON SUBSTRATES WOULD LEAD TO THE DEVELOPMENT OF A NEW GENERATION OF MICROELECTRONIC AND OPTOELECTRONIC INTEGRATED CIRCUITS.

BRIMROSE CORP OF AMERICA
7720 BELAIR RD
BALTIMORE, MD 21236
CONTRACT NUMBER:
DR RONALD G ROSEMEIER

TITLE:
HYBRID MICROCOMPUTER-BASED OPTICAL SIGNAL PROCESSOR UTILIZING
A TWO-DIMENSIONAL ACOUSTO-OPTIC MODULATOR
TOPIC# 11 OFFICE: IDENT#: 444

UNDER AN INITIAL RESEARCH PHASE, A 2-D ACOUSTO-OPTIC (A-O) EDITECTOR WAS CONSTRUCTED AND INCORPORATED IN A MATRIX MULTIPLICATION SYSTEM. NOT ONLY WAS A 2-D A-O DEVICE BUILT AND AN OPTICAL COMPUTING SYSTEM DESIGNED, BUT A 3X3 OPTICAL MATRIX MULTIPLIER ALSO WAS CONSTRUCTED TO DEMONSTRATE COMPUTING FEASIBILITY. IN THE CURRENT RESEARCH EFFORT BASED UPON PREVIOUS RESULTS, A 2-D A-O 32 CHANNEL DEFLECTOR IS BEING DESIGNED, CONSTRUCTED, TESTED, AND IMPROVED FOR USE IN A PROGRAMMABLE LOGIC ARRAY (PLA) OPTICAL COMPUTING SYSTEM. AN APPROPRIATE 32-FREQUENCY RADIO FREQUENCY SOURCE AND PLA OPTICAL TESTING SYSTEM ARE ALSO BEING DESIGNED AND CONSTRUCTED. AREAS BEING CONCENTRATED ON FOR IMPROVEMENT OF 2-D MULTICHANNEL DEVICE PERFORMANCE INCLUDE DIFFRACTION EFFICIENCY, TIME-BANDWIDTH PRODUCT, DYNAMIC RANGE, AND 2-D MULTICHANNEL TRANSDUCER DEPOSITION FOR USE IN A PLA OPTICAL COMPUTING SCHEME. APPLICATIONS FOR A 2-D A-O DEVICE ARE FOUND IN CONVENTIONAL OPTICAL FAN-IN, FAN-OUT AND FIBER OPTICAL COMPUTING SYSTEMS. OPTICAL PLA COMPUTING SYSTEMS ARE EXPECTED TO EVENTUALLY REPLACE CONVENTIONAL DIGITAL ELECTRONIC COMPUTER SYSTEMS.

CERAM-PHYSICS INC
921 EASTWIND DR - STE 110
WESTERVILLE, OH 43081
CONTRACT NUMBER:
W N LAWLESS

TITLE:
SOLID STATE OXYGEN COMPRESSOR FOR JOULE-THOMPSON CRYOCOOLERS
TOPIC# 3 OFFICE: IDENT#: 11

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IN THE INITIAL PHASE, RESEARCH IN SOLID-STATE TECHNOLOGY FOCUSED ON TWO COMPLEMENTARY AREAS: EXPERIMENTAL VERIFICATION OF FARADAY LAW OF ELECTROLYSIS FOR THE OXYGEN-CONDUCTING CERAMIC ELECTROLYTE OS-3 AND MATHEMATICAL MODELLING OF JOULE-THOMSON CRYOCOOLER PERFORMANCE BASED ON USING THIS CERAMIC AS AN OXYGEN COMPRESSOR IN THE FORM OF A HONEYCOMB STRUCTURE. MODELLING STUDIES WERE PERFORMED FOR BOTH OPEN AND CLOSED SYSTEMS, INCLUDING HEAT EXCHANGERS, AND SHOWED THAT SMALL (APPROX. 300-1000 cm³), LIGHTWEIGHT (APPROX. 1-3 kg) SYSTEMS COULD PROVIDE REFRIGERATION IN THE 54-90K TEMPERATURE RANGE. CURRENT RESEARCH CONSISTS OF DEMONSTRATING AND EVALUATING A PROTOTYPE CRYOCOOLER SYSTEM. THE RESEARCH IS DIVIDED INTO FIVE CATEGORIES: REFINEMENTS OF CERAMIC HONEYCOMBS; CONSTRUCTION OF VIABLE HONEYCOMB COMPRESSORS; CONSTRUCTION OF SMALL JOULE-THOMSON CRYOSTATS; TESTING OF COMPRESSOR-CRYOSTAT SYSTEMS; AND CONTINUATION OF SYSTEMS MODELLING STUDIES PLUS DESIGN STUDIES. PROTOTYPE CRYOCOOLER SYSTEMS ARE BEING ASSEMBLED AND INSTRUMENTED FOR BOTH OPEN AND CLOSED SYSTEM CASES. A MATRIX OF CONDITIONS IS BEING EXAMINED EXPERIMENTALLY INCLUDING REFRIGERATION POWER AND TEMPERATURE, INPUT POWER, AND COMPRESSOR TEMPERATURE. MASS FLOW RATES IN THE RANGE 5-10 mg/s ARE BEING WATCHED CLOSELY. WHEN SUCCESSFUL, THIS RESEARCH WOULD RESULT IN COMPACT, RELIABLE REFRIGERATION OF INFRARED DETECTORS IN THE 54-90K RANGE.

COMBUSTION SCIENCES INC
208 ELMWOOD RD
CHAMPAIGN, IL 61821
CONTRACT NUMBER:
DR HERMAN KRIER
TITLE:
LASER PROPULSION THRUSTERS
TOPIC# 6 OFFICE:

IDENT#: 21

A LASER THRUSTER DESIGN HAS BEEN COMPLETED, AND A DEVELOPMENTAL PROTOTYPE IS BEING CONSTRUCTED. THE DEVICE WILL GENERATE THRUST BY CONVERTING THE ENERGY OF A REMOTE, FOCUSED LASER BEAM INTO THE HEAT ENERGY OF A FLOWING PROPELLANT GAS WITH THE HOT PROPELLANT THEN EXHAUSTED THROUGH A CONVENTIONAL ROCKET NOZZLE. A HIGH TEMPERATURE LASER SUSTAINED PLASMA (LSP) ABSORBS THE LASER ENERGY IN A LOCALIZED

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15,000-20,000 DEGREE K BREAKDOWN REGION, WHERE ELECTRONS IN THE GAS ABSORB LASER PHOTONS THROUGH A HIGHLY EFFICIENT INVERSE BREMSSTRAHLUNG CONTINUUM PROCESS. THE THRUSTER WILL BE CHARACTERIZED AT OPERATIONS OF 10 AND 100 kW FOR THRUST, SPECIFIC IMPULSE (Isp), ENERGY CONVERSION EFFICIENCY, THRUSTER WALL HEATING, NOZZLE COOLING, ETC. SUCCESSFUL DEVELOPMENT CAN LEAD TO A VARIETY OF APPLICATIONS IN SPACE, AND SPINOFFS IN THE USE OF REMOTE LASER POWERED THRUSTERS FOR POSITIONING, ROBOTICS, REMOTE POWER GENERATION, ETC.

COMPUTATIONAL ENGR (BUSINESS & TECH SYS)

14504 GREENVIEW DR - STE 500

LAUREL, MD 20708

CONTRACT NUMBER:

WALLACE E LARIMORE

TITLE:

SYSTEM IDENTIFICATION AND CONTROL USING SINGULAR VALVE

DECOMPOSITION SYSTOLIC ARRAYS

TOPIC# 10

OFFICE:

IDENT#: 518

IN THE PREVIOUS RESEARCH PHASE, A NEW CLASS OF ALGORITHMS BASED UPON A GENERALIZED SINGULAR VALUE DECOMPOSITION (SVD) WAS DEVELOPED AND DEMONSTRATED FOR SYSTEM IDENTIFICATION, STATISTICAL MODEL ORDER DETERMINATION, MODEL ORDER REDUCTION, AND PREDICTIVE CONTROL. A CANNONICAL VARIATE ANALYSIS (CVA) METHOD WAS USED IN DETERMINING THE OPTICAL STATE OF A RESTRICTED ORDER IN SYSTEM IDENTIFICATION, REDUCED ORDER STOCHASTIC FILTERING, AND MODEL PREDICTIVE CONTROL (MPC). IN THE CURRENT RESEARCH EFFORT, A SYSTOLIC ARRAY PROCESSOR BASED UPON SVDs IS BEING DEVELOPED AND DEMONSTRATED IN SYSTEM IDENTIFICATION AND CONTROL OF A LARGE SCALE SYSTEM. THE RESEARCH INCLUDES: REFINEMENT OF THE STOCHASTIC MPC AND CVA ALGORITHMS; CONFIGURATION OF A HARDWARE SYSTOLIC ARRAY FROM AVAILABLE EQUIPMENT; DEVELOPMENT OF SOFTWARE ON THE SYSTOLIC ARRAY FOR SVD-BASED SYSTEM IDENTIFICATION AND CONTROL; AND DEMONSTRATION OF THE SYSTOLIC ARRAY PROCESSOR ON A LARGE SCALE SYSTEM. WHEN SUCCESSFUL, THIS WOULD REPRESENT THE FIRST STEP TOWARD WIDESPREAD USE OF THESE METHODS FOR REAL TIME AND LARGE SCALE APPLICATIONS. BENEFITS INCLUDE DEFENSE SYSTEMS REQUIRING ONLINE ADAPTIVE CONTROL INCLUDING FLUTTER SUPPRESSION, FAILURE DETECTION, CONTROL OF LARGE SPACE STRUCTURES, AND TARGET DETECTION AND TRACKING. COMMERCIAL APPLICATIONS EXIST IN CHEMICAL PROCESS

SUBMITTED BY

CONTROL, CONTROL AND IDENTIFICATION OF POWER PLANTS, AND ADAPTIVE
CONTROL IN INDUSTRIAL MANUFACTURING AND ROBOTICS.

COVALENT ASSOCS INC
52 DRAGON CT
WOBBURN, MA 01801
CONTRACT NUMBER:
DR V R KOCH
TITLE:
MICROCRYSTALLITE TITANIUM DISULFIDE CATHODES FOR PULSE POWER
TOPIC# 5 OFFICE: IDENT#: 428

SPACE-BASED PLATFORMS REQUIRE HUNDREDS OF MEGAWATTS OF POWER FOR BURST MODE APPLICATIONS WHICH STATE-OF-THE-ART BATTERY HARDWARE CANNOT MEET. CAPABILITIES OF THE RECHARGEABLE LITHIUM/TITANIUM (Li/TiS₂) BATTERY COUPLE WITH ITS HIGH ENERGY DENSITY ARE BEING INVESTIGATED WITH RESPECT TO PULSE POWER DISCHARGES. ULTRA THIN (<10 MICRONS) ORIENTED TiS₂ MICROCRYSTALLITES SYNTHESIZED DIRECTLY ONTO A Ti CURRENT COLLECTOR ARE EXPECTED TO ALLOW A Li/TiS₂ CELL TO OPERATE AT A HIGH RATE FOR MANY THOUSANDS OF CYCLES. IN THE PREVIOUS RESEARCH EFFORT, Li/TiS₂ CELLS PROVIDED IMPRESSIVE PULSE POWER CHARACTERISTICS: RATES AND POWER DENSITIES OF UP TO 900 mA/cm² AND 650 mW/cm², RESPECTIVELY. CYCLE LIVES IN EXCESS OF 10⁵ WERE ACHIEVED AND CALCULATED GRAVIMETRIC AND VOLUMETRIC ENERGY DENSITIES FOR A REALISTIC BIPOLAR CELL CONFIGURATION WERE 42 kW/kg AND 68 kW/l, RESPECTIVELY. CURRENT RESEARCH IS EXTENDING THIS THIN FILM TiS₂ TECHNOLOGY TO THREE-DIMENSIONAL Ti FIBER MAT SUBSTRATES AND INVOLVES THE PREPARATION OF MIXED TRANSITION METAL CHALCOGENIDE CATHODES. THIN FILMS TiS₂ FORMED BY THERMAL SULFURIZATION ARE BEING INTERMIXED WITH SEVERAL OTHER HIGH VOLTAGE, HIGH CAPACITY CATHODE MATERIALS FORMED BY CHEMICAL VAPOR DEPOSITION. THESE NEW MATERIALS ARE BEING PHYSICALLY, CHEMICALLY, AND ELECTROCHEMICALLY CHARACTERIZED. SINGLE CELL AND BIPOLAR BATTERY STACKS COMPRISING Li/TiS₂ AND Li/TiS₂ MIXED CATHODES ARE BEING PULSED CYCLED. A PROTOTYPE BIPOLAR Li/TiS₂ IS BEING DEVELOPED FOR FUTURE SPACE-BASED SYSTEMS.

CREARE INC
PO BOX 71 - ETNA RD
HANOVER, NH 03755
CONTRACT NUMBER:
W DODD STACY
TITLE:
ULTRA RELIABLE CRYOCOOLER FOR SATELLITE SENSOR COOLING
TOPIC# 3 OFFICE: IDENT#: 213

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THE OBJECTIVE OF THE PHASE II PROJECT IS TO EXPERIMENTALLY DEMONSTRATE THE PERFORMANCE OF SMALL STIRLING CYCLE CRYOCOOLER WITH INNOVATIVE DESIGN AND CONSTRUCTION FEATURES. THE EFFORT ENTAILS DESIGN AND DEVELOPMENT OF COMPONENTS, INTEGRATION INTO AN ENGINEERING MODEL CRYOCOOLER, AND TESTING OF THE CRYOCOOLER FOR PERFORMANCE AND ENDURANCE. ANTICIPATED BENEFITS OF THE INNOVATIVE DESIGN INCLUDE FIVE PLUS YEARS OPERATING LIFE WITH HIGH RELIABILITY, HIGH EFFICIENCY, LIGHT WEIGHT AND LOW COST. THE DURABILITY OF THE CENTRAL DESIGN FEATURE WAS SUCCESSFULLY DEMONSTRATED IN THE PREVIOUS RESEARCH EFFORT. POTENTIAL APPLICATIONS OF THIS DEVELOPMENT INCLUDE THE COOLING OF OPTICAL SENSORS, CRYOSTAT THERMAL SHIELDS, BIOLOGICAL RESEARCH SPECIMENTS, AND HIGH Tc SUPERCONDUCTING DEVICES. PROLIFERATION OF THE LATTER WILL BE SIGNIFICANTLY ENHANCED BY THE AVAILABILITY OF ROBUST AND RELIABLE LOW COST SMALL CRYOCOOLERS.

CRYSTALLUME

3180 PORTER DR - STE 2

PALO ALTO, CA 94304

CONTRACT NUMBER:

DR J MICHAEL PINNEO

TITLE:

PLASMA-ENHANCED CHEMICAL VAPOR DEPOSITED DIAMOND THIN FILMS
FOR TRIBOLOGICAL AND OPTICAL MATERIALS

TOPIC# 13

OFFICE:

IDENT#: 432

IN THE PREVIOUS RESEARCH PHASE, A SYSTEMATIC MEANS WAS DEVELOPED FOR RELIABLE DEPOSITION OF OPTICAL AND/OR TRIBOLOGICAL-QUALITY DIAMOND THIN FILMS ON SUBSTRATES. IN THE CURRENT RESEARCH EFFORT, A SILICON-ON-DIAMOND (SOD) TECHNOLOGY IS BEING DEVELOPED THAT IS EXPECTED TO PRODUCE INTEGRATED CIRCUITS WITH PERFORMANCE CAPABILITIES SUPERIOR TO EXISTING SILICON-ON-INSULATOR (SOI) APPROACHES INCLUDING SILICON-ON-SAPPHIRE, SEPARATION BY IMPLANTATION OF OXYGEN, AND EPITAXIAL LAYER OVERGROWTH. SOD STRUCTURES ARE BEING FABRICATED AND THE VARIOUS LAYERS AND INTERFACES STRUCTURALLY AND ELECTRICALLY CHARACTERIZED. PROPERTIES OF DIAMOND, DIAMOND-SILICON INTERFACE, AND SILICON ARE BEING ADDRESSED. CREATION OF VERY THIN SILICON FILMS (<50nm) ON DIAMOND IS BEING ATTEMPTED AND SUCH FILMS ARE BEING CHARACTERIZED FOR THEIR SUITABILITY IN DEVICE FABRICATION.

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FABRICATION IS BEING CARRIED OUT OF CANDIDATE CIRCUITS WHICH BENEFIT FROM SUCH STRUCTURES IN INCREASING THEIR FUNCTIONAL CAPABILITY, RADIATION TOLERANCE AND THERMAL MANAGEMENT. PRODUCTION IS BEING UNDERTAKEN OF 4 INCH SILICON-ON-DIAMOND WAFERS SUITABLE FOR FABRICATION INTO SOI INTEGRATED CIRCUITS. PROTOTYPE DEVICES ALSO ARE BEING DEVELOPED. IN COMPARISON TO EXISTING SOI TECHNOLOGIES, SOD CIRCUITS SHOULD ENJOY HIGHER DENSITY, HIGHER OPERATING SPEED, LOWER DYNAMIC POWER CONSUMPTION, INCREASED POWER DISSIPATION, AND IMMUNITY FROM LATCH-UP AND RADIATION DAMAGE.

DISPLAYTECH INC
2200 CENTRAL AVE - STE C
BOULDER, CO 80301
CONTRACT NUMBER:
MARK HANDSCHY

TITLE:

HIGH PERFORMANCE SPATIAL LIGHT MODULATORS USING FERROELECTRIC LIQUID CRYSTALS

TOPIC# 11 OFFICE: IDENT#: 452

SPATIAL LIGHT MODULATORS (SLMs) ARE CRITICAL COMPONENTS OF HIGHLY PARALLEL OPTICAL SYSTEMS NEEDED FOR THE HIGH-SPEED TASKS OF INTELLIGENT WEAPONRY. NOVEL, HIGH PERFORMANCE SLMs ARE BEING DEVELOPED FROM ARRAYS OF FERROELECTRIC LIQUID CRYSTAL (FLC) LIGHT VALVES. FLC TECHNOLOGY PROMISES TO OVERCOME SHORTCOMINGS OF CURRENTLY AVAILABLE SLMs, OFFERING SPEED, VERSATILITY, AND LOW POWER CONSUMPTION AT LOW COST. IN PREVIOUS RESEARCH, IT WAS DEMONSTRATED THAT THE FLCs BISTABILITY AND SHARP THRESHOLD COULD BE EXPLOITED IN A MATRIX-ADDRESSED MULTIPLEXING SCHEME, YIELDING A 4 X 4 SLM WITH 8:1 CONTRAST AND 132 MICROSECOND LINE ADDRESS TIME. IN THE CURRENT RESEARCH EFFORT, RESEARCH AND DEVELOPMENT OF IMPROVED FLC MATERIALS, ALIGNMENT TECHNIQUES, AND DRIVING WAVEFORMS IS EXPECTED TO YIELD A 128 X 128 SLM WITH 300 Hz FRAME RATE AND CONTRAST IMPROVED TO 100:1. FURTHER DEVELOPMENT OF ELECTRONIC DRIVER PACKAGING AND INTERCONNECTION METHODS IS ANTICIPATED TO YIELD A COMPACT AND RUGGED 256 X 256 SLM, AGAIN WITH 300 Hz FRAME RATE. WHEN SUCCESSFUL, THE FIRST SIMPLE-TO-FABRICATION, LOW COST, FAST, HIGH CONTRAST SLM WOULD BE DEMONSTRATED. AN SLM WITH THESE PROPERTIES WOULD HAVE MYRIAD APPLICATIONS IN OPTICAL SIGNAL PROCESSING AND COMPUTING.

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DYNAMICS TECHNOLOGY INC
21311 HAWTHORNE BLVD - STE 300
TORRANCE, CA 90503
CONTRACT NUMBER:
C MICHAEL DUBE
TITLE:
COMPOSITE EMBEDDED FIBER OPTIC SENSORS FOR ACTIVE CONTROL
OF SPACE STRUCTURES
TOPIC# 12 OFFICE: IDENT#: 342

PHASE I EMPLOYED A MACH-ZEHNDER HOMODYNE INTERFEROMETRIC FIBER OPTIC SENSOR DESIGN THAT USED ACTIVE CLOSED-LOOP FEEDBACK, A CONFIGURATION THAT PROVIDES THE HIGHEST STRAIN AMPLITUDE RESPONSE AND CALIBRATION STABILITY. THE SENSOR WAS EMBEDDED IN A LOOP CONFIGURATION BETWEEN LAYERS OF GRAPHITE/BISMALEIMIDE LAMINATES. BOTH FREQUENCY AND AMPLITUDE RESPONSE OF THE EMBEDDED SENSOR WERE MEASURED AND FOUND TO BE CONSISTENT WITH THE PREDICTED VALUE. OVERALL TECHNICAL ACHIEVEMENTS THUS FAR ARE: COMPOSITE LAMINATE STRIPS WITH DIMENSIONS 12x3x0.11 INCHES WERE SUCCESSFULLY FABRICATED AND EMBEDDED WITH THE SINGLE MODE FIBER OPTIC SENSOR; GOOD FREQUENCY RESPONSE WITH A RANGE OF AT LEAST 0.1Hz TO MORE THAN 1KHz; AMPLITUDE RESPONSE OF THE SENSORS WAS LINEAR WITH RESPECT TO DISPLACEMENT; AND THE NOISE EQUIVALENT STRAIN WAS FOUND TO BE A LOW [10 TO THE NEGATIVE 10TH POWER DIVIDED BY THE SQUARE ROOT OF Hz] AT THE HIGHER FREQUENCIES, WITH INTERFEROMETER TRACKING RANGE BEING 41 MICRONS (150 dB DYNAMIC RANGE). TECHNICAL IMPROVEMENTS FOR THE PHASE I EFFORT ARE: SIGNIFICANTLY REDUCED SENSOR HYSTERESIS; DC DRIFT REDUCED BY AS MUCH AS 100 TIMES WITH TEMPERATURE STABILIZATION OF THE LASER SOURCE; AND THE SENSOR DYNAMIC RANGE CAN BE FURTHER BROADENED BY INCREASING THE PHASE TRACKING RANGE OF SYSTEM INTEGRATION WITH ACTIVE CONTROLS.

E-TEK DYNAMICS INC
250 EAST DR
MELBOURNE, FL 32904
CONTRACT NUMBER:
J J PAN
TITLE:
OPTICAL MULTIPLE TARGET SURVEILLANCE POINTING ACQUISITION
AND TRACKING SENSORS
TOPIC# 3 OFFICE: IDENT#: 40

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FOR THE SPACE-BASED STRATEGIC DEFENSE SYSTEM, CONVENTIONAL OPTICAL BEAM POINTING/STEERING/TRACKING SYSTEM USING MECHAICAL GIMBALS HAS NUMEROUS SHORTCOMINGS SUCH AS HEAVY WEIGHT, HIGH PROBABILITY OF ERRORS, LONG ACQUISITION TIME, AND LARGE FRICTIONAL AND BEARING NOISE. THE CONVENTIONAL MECHANICAL SERVO CANNOT TRACK MULTIPLE TARGETS SIMULTANEOUSLY AND CANNOT PERFORM WIDE ANGLE SURVEILLANCE DUE TO LIMITED BANDWIDTH OF SERVO LOOPS. TO REDUCE OR ELIMINATE THESE SHORTCOMINGS, MULTIAPERTURE COMPOUND EYE CONFIGURATIONS AND ADAPTIVE OPTICAL MULTIBEAM PHASED STEERING ARRAYS FOR MULTIPLE TARGETS SURVEILLANCE, POINTING, ACQUISITION, AND TRACKING WERE INVESTIGATED, ANALYZED AND COMPARED AGAINST DERIVED DESIGN PARAMETERS IN THE PREVIOUS RESEARCH PHASE. IN THE CURRENT EFFORT, 1 X 6 AND 2 X 3 CURVED PHASED-ARRAYS USING LiNbO3 OR GaAs INTEGRATED PHASE SHIFTERS ARE BEING CONSTRUCTED AND EVALUATED. OPTICAL INJECTION-LOCKING IS BEING EMPLOYED TO SYNCHRONIZE THE ARRAYED LASERS TO A MASTER LASER. ANTICIPATED BENEFITS INCLUDE OPTICAL POWER COMBINING, LASER BEAM SHARPENING, RAPID BEAM STEERING, COHERENT COMMUNICATIONS AND OPTICAL RADAR. APPLICATIONS EXIST IN OPTICAL SIGNAL PROCESSING/COMPUTING, FIBER OPTICS, CARDIOVASCULAR TREATMENT AND MICROSURGERY.

ELECTRIC PROPULSION LAB INC
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TEHECHAPI, CA 93561

CONTRACT NUMBER:

DR GRAEME ASTON

TITLE:

PLASMA CONTAINMENT SCHEME FOR HIGH THRUST DENSITY ION ENGINES

TOPIC# 6

OFFICE:

IDENT#: 223

ION ENGINES HAVE THE HIGHEST EFFICIENCY AND SPECIFIC IMPULSE OF ANY ELECTRIC PROPULSION TECHNOLOGY. HOWEVER, FUNDAMENTAL THERMAL/MECHANICAL STABILITY LIMITATIONS INHERENT IN PRESENT ION ENGINE ACCELERATOR SYSTEM DESIGNS PREVENT THE DEVELOPMENT OF LARGE DIAMETER, HIGH THRUST ION ENGINES. DURING A PREVIOUS RESEARCH PHASE, AN ANNULAR ACCELERATOR SYSTEM AND DISCHARGE CHAMBER DESIGN GEOMETRY WAS SHOWN TO BE TECHNICALLY FEASIBLE. IN THE CURRENT RESEARCH EFFORT, THE FEASIBILITY OF THE ANNULAR GRID CONCEPT IS BEING FURTHER EVALUATED THROUGH A SERIES OF TESTS WITH A SINGLE GRID AND AN

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IMPROVED GRID MEASUREMENT TECHNIQUE. ION THRUSTER OPTIMIZATION WITHOUT BEAM EXTRACTION IS BEING VALIDATED. FABRICATION AND TESTING OF A HIGH CURRENT HOLLOW CATHODE IS BEING PERFORMED. WHEN SUCCESSFULLY DEMONSTRATED, A PROTOTYPE 50cm DIAMETER TWO GRID ANNULAR XENON ION ENGINE IS BEING DEVELOPED WITH AN ANTICIPATED INPUT POWER OF 30 kw AND THRUST OF 0.5N AT A SPECIFIC IMPULSE OF 2,500 SEC. THIS THRUST WOULD BE NEARLY AN ORDER OF MAGNITUDE GREATER THAN HAS BEEN ACHIEVED WITH AN ION ENGINE AT THIS SPECIFIC IMPULSE. CONSEQUENTLY, WHEN SUCCESSFULLY DEMONSTRATED, LAUNCH MASS REQUIREMENTS WOULD BE REDUCED SIGNIFICANTLY.

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TIMOTHY R KNOWLES

TITLE:

GRAPHITE/PHASE-CHANGE-MATERIAL THERMAL STORAGE COMPOSITE

TOPIC# 7

OFFICE:

IDENT#: 461

THE GOAL OF THIS PROGRAM IS THE DEVELOPMENT OF HIGH FLUX THERMAL ENERGY STORAGE DEVICES INCORPORATING NOVEL GRAPHITE COMPOSITE MATERIALS. THE HIGHEST FLUX CAPABILITY AND THE HIGHEST POWER-TO-WEIGHT RATIO ARE ACHIEVABLE UTILIZING ANNEALED PYROLYTIC GRAPHITE AS THE THERMAL CONDUCTIVITY COMPONENT THAT IS DISPERSED IN A PHASE-CHANGE MATRIX. INTIMATE THERMAL CONTACT BETWEEN THE GRAPHITE COMPONENTS AND THE PRIMARY HEAT TRANSFER SURFACE IS NECESSARY. MEANS OF PASSIVATING GRAPHITE AGAINST CHEMICAL ATTACK BY ALKALI HALIDE IS NEEDED FOR HIGH TEMPERATURE APPLICATIONS. WE WILL FABRICATE INTEGRAL STRUCTURES BY VAPOR DEPOSITION OF GRAPHITE FIBERS DIRECTLY ONTO SUITABLE SUBSTRATES. THE CONTROL OF THE FIBER DISTRIBUTION AND MORPHOLOGY WILL BE STUDIED BY VARYING THE GROWTH CONDITIONS DETERMINED BY THE REACTANT GASES, THE CATALYST SEEDING, AND THE FURNACE POWER. ANNEALING AND GRAPHITIZATION WILL BE PERFORMED AT HIGH TEMPERATURES. ATTEMPTS WILL BE MADE TO DEPOSITE DIAMOND-LIKE COATINGS AS WELL AS OTHER COATINGS TO PASSIVATE THE GRAPHITE AGAINST INTERCALATION AND CORROSION. HIGH CONDUCTIVITY THERMAL ENERGY STORAGE MATERIALS ARE REQUIRED FOR BOTH HIGH-FLUX PULSED-POWER AND FOR DEMANDING TEMPERATURE CONTROL APPLICATIONS.

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THE LOW DENSITY AND HIGH THERMAL PERFORMANCE OF THE PROPOSED MATERIALS MAKE THEM GENERALLY USEFUL FOR SPACECRAFT THERMAL MANAGEMENT, SURVIVABILITY, AND POWER SYSTEMS APPLICATIONS.

FIBERTEK INC
510-A HERNDON PKWY
HERNDON, VA 22070
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DR WALTER KOECHNER
TITLE:
HIGHLY DIRECTIONAL AND SENSITIVE GAMMA/NEUTRON DETECTOR
TOPIC# 3 OFFICE: IDENT#: 351

PREVIOUS RESEARCH DEMONSTRATED THAT PLASTIC SCINTILLATOR FIBERS COULD BE USED AS THE BASIS FOR A LARGE AREA, SPACE-BASED DETECTOR, CAPABLE OF DETERMINING THE ENERGY AND TYPE OF INCIDENT PARTICLE, AS WELL AS THE PARTICLE'S IMPACT POINT. IN THIS INVESTIGATION, A PROTOTYPE FOR A SPACE-BASED DETECTOR SYSTEM IS BEING DESIGNED AND CONSTRUCTED. THE FIBERS ARE BEING COUPLED TO MICROCHANNEL PLATE PHOTOMULTIPLIER TUBES AT EACH END TO PROVIDE UNIT FIBER RESOLUTION. PULSE HEIGHT DATA FROM INDIVIDUAL INCIDENT PARTICLES IS BEING OBTAINED VIA PULSE HEIGHT SPECTROSCOPY OF COINCIDENTALLY COLLECTED SCINTILLATOR LIGHT OUTPUT PULSES. THE SENSOR IS EXPECTED TO BE CAPABLE OF DISCRIMINATING FAST NEUTRONS FROM GAMMA RAYS OF LOW ENERGIES. THE PRIMARY FUNCTION OF THE SENSOR WOULD BE TO DETECT THE PRESENCE OF IONIZING RADIATION THAT IS BACKSCATTERED WHEN A PARTICLE BEAM INTERROGATES A TARGET OR DECOY. THE SENSOR IS TARGETED TO BE LIGHTWEIGHT, MODULAR IN DESIGN, EXPANDABLE AND SPACE-QUALIFIED. A NUMBER OF POTENTIAL APPLICATIONS EXIST FOR A LARGE AREA RADIATION DETECTOR CAPABLE OF ENERGY DISCRIMINATION. SUCH A SENSOR COULD BE DESIGNED TO ALSO DETECT THE TRAJECTORY OF A PARTICLE BEAM.

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CONTRACT NUMBER:
DR RICHARD WEISMAN
TITLE:
HIGH STRENGTH ELECTRICAL INSULATION COMPOSITES
TOPIC# 5 OFFICE: IDENT#: 62

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TWO FORMULATIONS OF NOMEX TYPE 418 COMPOSITES HAVE BEEN DEVELOPED WHICH EXHIBIT EXCELLENT RESISTANCE TO HIGH PRESSURE (43 KIPS) AND HIGH TEMPERATURE (APPROX. 20,000 DEG C), BUT NOT TESTED SIMULTANEOUSLY. ADDITIONAL TESTS ARE BEING CONDUCTED, ALONG WITH TESTS ON OTHER TYPES OF NOMEX, TO CHARACTERIZE THE THERMAL AND MECHANICAL PERFORMANCE UNDER CONDITIONS APPROXIMATING ACTUAL USE AS A GUN BORE INSULATING MATERIAL. METHODS OF SCALING AND FABRICATING THE COMPOSITES INTO USEFUL SIZES AND SHAPES ARE ALSO BEING DONE. SUCCESSFUL FABRICATION OF THESE HIGH STRENGTH, HIGH INSULATING COMPOSITES CAN HAVE WIDE APPLICATION IN BOTH MILITARY AND COMMERCIAL PRODUCTS, SUCH AS: ELECTROMAGNETIC GUN DEVICES, MAGNETIC LEVITATION VEHICLES, LARGE ROTATING MACHINES, ELECTRICAL POWER TRANSFORMERS, ENGINE COMPONENTS, ETC.

FOSTER-MILLER INC
350 SECOND AVE
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CONTRACT NUMBER:

MARK DRUY

TITLE:

BISTABLE ORGANIC POLYMER NONLINEAR OPTICAL DEVICES

TOPIC# 11

OFFICE:

IDENT#: 195

THIS PROJECT HAS SUCCESSFULLY DEMONSTRATED OPTICAL BISTABILITY IN FILMS OF LARC-TPI, A THERMOPLASTIC POLYIMIDE. THIS IS THE FIRST CLASS EXAMPLE OF DISPERSIVE BISTABILITY IN NONLINEAR OPTICAL POLYMER FILMS USEFUL FOR OPTICAL SENSOR PROTECTION AND OPTICAL DATA PROCESSING. THE LARC-TPI POLYIMIDE IS A HIGHLY STABLE HIGH TEMPERATURE POLYMER WITH MEASURED PICOSECOND RESPONSE TIME. THE SUCCESSFUL FABRICATION OF AN OPTICAL DEVICE USING THIS FILM WILL PAVE THE WAY FOR MANY COMMERCIAL AND MILITARY APPLICATIONS, INCLUDING: OPTICAL SWITCHING IN FIBER OPTIC NETWORKS, OPTICAL LOGIC DEVICES FOR ADVANCED COMPUTERS, AND CONTROLLABLE OPTICAL LIMITERS FOR THE PROTECTION OF HUMAN EYES OR SENSITIVE OPTICAL SENSORS.

FOSTER-MILLER INC
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CONTRACT NUMBER:

LAWRENCE H DOMASH

TITLE:

ALL OPTICAL CELLULAR AUTOMATION COMPUTER

TOPIC# 11

OFFICE:

IDENT#: 196

SUBMITTED BY

STRATEGIC COMPUTING CALLS FOR THE SPEED AND PARALLELISM OFFERED BY OPTICAL METHODS, BUT FEW SYSTEMS DEMONSTRATIONS EXIST. PREVIOUS RESEARCH IDENTIFIED A SPECIFIC TWO-DIMENSIONAL CELLULAR AUTOMATON AS A UNIQUELY PROMISING PARALLEL OPTICAL DIGITAL COMPUTING ARCHITECTURE FOR STRATEGIC DEFENSE, AND DESIGNED A NOVEL PROCESSOR COMPOSED OF THREE TYPES OF PHOTOREFRACTIVE NONLINEAR OPTICAL DEVICES IN CASCADE. PHASE II RESEARCH WILL CONSTRUCT A LABORATORY DEMONSTRATION. THE EXPERIMENTAL PLAN INCLUDES SPECIFIC SOLUTIONS TO THE GENERIC PROBLEMS OF CORRELATION, STORAGE, TIMING, ITERATION, THRESHOLDING AND BINARIZATION THROUGH NONLINEAR OPTICS. CELLULAR AUTOMATA CAN SERVE AS MODELS FOR BATTLEFIELD SIMULATION, PHYSICS OR BIOLOGY PROBLEMS; COMPUTATIONALLY UNIVERSAL AUTOMATA CAN EMULATE ANY COMPUTER. USING IMPROVED MATERIALS PROCESSING OF 1000 x 1000 CELL AUTOMATION FRAMES IN 1 NSEC APPEARS POSSIBLE, 10 MILLION TIMES THE POWER OF CRAY. THE PHASE II DEMONSTRATION WILL CONSTITUTE ONE OF THE FIRST SELF-CONTAINED, FULLY FUNCTIONAL OPTICAL COMPUTERS PERFORMING A COMPLETE, RECOGNIZABLE COMPUTATION FUNCTION, AND WILL YIELD PRACTICAL LESSONS APPLICABLE TO MORE COMPLEX ARCHITECTURES SUCH AS OPTICAL NEURAL NETS. POTENTIAL AS COMMERCIAL OPTICAL PROCESSOR WILL BE ASSESSED. A HIGH SPEED ALL-OPTICAL PARALLEL CELLULAR AUTOMATION COMPUTER WOULD SERVE AS A COPROCESSOR WITH APPLICATIONS FOR STRATEGIC DEFENSE BATTLE MANAGEMENT, IMAGE PROCESSING AND MODELING AND SIMULATION OF PHYSICS PROBLEMS, POTENTIALLY YIELDING THE FIRST COMMERCIAL APPLICATION OF OPTICAL COMPUTING.

FOSTER-MILLER INC
350 SECOND AVE
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CONTRACT NUMBER:
RICHARD W LUSIGNEA
TITLE:

LIGHTWEIGHT CRYOGENIC TANKS FROM ORDERED POLYMER FILMS
TOPIC# 6 OFFICE: IDENT#: 198

AN IMPERMEABLE FILM LAMINATE OF POLY P-PHENYLENE BENZOBISTHIAZOLE (PBZT) COMPOSITE HAS BEEN DEVELOPED WHICH HAS BEEN TESTED AT REPEATED CYCLES FROM ROOM TEMPERATURE TO 20,000 DEG C. TESTS SHOW IMPERMEABILITY TO MANY LIQUIDS, WITH SOME INCONCLUSIVE RESULTS USING

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LIQUID OXYGEN. ADDITIONAL FABRICATION MATERIALS AND DEVICE FABRICATION TECHNIQUES ARE BEING CONDUCTED TO DEVELOP A LIGHTWEIGHT, IMPERMEABLE, COMPOSITE CRYOGENIC TEST TANK USING PBZT TYPE FILMS. IF SUCCESSFUL, THESE COMPOSITES WILL PERMIT FABRICATION OF MORE DURABLE, HIGHER PERFORMANCE TANKS FOR SPACECRAFT BOOSTERS AND OTHER SPACE CRYOGENIC LIQUID STORAGE FACILITIES. THESE FILMS COULD ALSO BE USED FOR LIQUID STORAGE TANKS FOR USE ON TRANSPORT VEHICLES SUCH AS RAIL CARS, TRUCKS, AND SHIPS.

GENERAL PNEUMATICS CORP
7662 E GRAY RD - STE 107
SCOTTSDALE, AZ 85260
CONTRACT NUMBER:
WOODY ELLISON

TITLE:
LOW CAPACITY RELIQUEFIER FOR STORAGE OF CRYOGENIC FLUIDS
TOPIC# 6 OFFICE: IDENT#: 75

A PRELIMINARY DESIGN HAS BEEN COMPLETED UNDER PHASE I FOR A CRYOREFRIGERATOR TO RELIQUEFY CRYOGENIC HELIUM BOIL-OFF AND THEREBY PROLONG THE MISSION LIVES OF SPACECRAFT DEPENDENT ON CRYOGENIC COOLING. THE RELIQUEFICATION IS ACCOMPLISHED THROUGH A STIRLING CRYOCOOLER WITH A ZIMMERMAN DISPLACER, A JOULE-TOMSON CRYOSTAT, AND A THREE STAGE HELIUM COMPRESSOR. TWO NEW CONCEPTS IN HEAT EXCHANGERS ARE USED; A BONDED PARTICULATE MATRIX, AND THERMAL COMPOSITES. ALSO EMPLOYED IS AN INNOVATIVE DRIVE MECHANISM KNOWN AS THE ROSS LINKAGE WHICH MINIMIZED WEAR. THESE PROVIDE MAJOR ADVANCES IN POWER, SIZE, AND WEIGHT EFFECTIVENESS. THE SUCCESSFUL FABRICATION AND TEST OF THE RELIQUEFIER UNDER PHASE II WILL PERMIT ITS DEVELOPMENT AND USE FOR A VARIETY OF CRYOREFRIGERATION APPLICATIONS. BESIDES HELIUM THE RELIQUEFIER CAN BE USED TO LIQUIFY OTHER GASSES SUCH AS OXYGEN, HYDROGEN, NITROGEN, ETC.

GT-DEVICES INC
5705A GENERAL WASHINGTON DR
ALEXANDRIA, VA 22312
CONTRACT NUMBER:
RODNEY L BURTON

TITLE:
LIQUID PROPELLANT PULSED ELECTROTHERMAL THRUSTER
TOPIC# 6 OFFICE: IDENT#: 81

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A SYSTEM DESIGN HAS BEEN EXAMINED TO PROVIDE A 10^7 - 10^9 PULSE LIFE CYCLE WATER PROPELLANT PULSED ELECTROTHERMAL (PET) THRUSTER. THIS PROJECT IS CURRENTLY DEVELOPING A 5 KW THRUSTER CONSISTING OF A RADIATION-COOLED HEAD, 400 pps PFN, AND A PROPELLANT FEED SYSTEM, WHICH WILL BE TESTED USING A LABORATORY POWER SUPPLY ON A SWING ARM THRUST STAND. FOLLOWING PERFORMANCE TESTING, THE UNIT WILL BE TESTED TO A LIFETIME OF 5 TIMES 10^7 PULSES (50 HOURS). WHEN SUCCESSFUL, THIS PROPULSION SYSTEM WILL PROVIDE AN EFFICIENT SPACE THRUSTER FOR ATTITUDE CONTROL, STATION KEEPING, ORBIT TRANSFER, AND STRATEGIC SPACECRAFT MANEUVERING FOR MILITARY AND COMMERCIAL SPACE VEHICLES SUCH AS COMMUNICATIONS SATELLITES.

IONIC ATLANTA INC
1347 SPRING ST
ATLANTA, GA 30309
CONTRACT NUMBER:
DR KEITH O LEGG

TITLE:
SPACE-BASED OPTICAL COMPONENTS PROTECTION BY HARD ADHERENT
DIAMOND COATINGS
TOPIC# 13 OFFICE: IDENT#: 293

DIAMOND IS PRACTICALLY THE ONLY MATERIAL WHICH IS STRUCTURALLY, CHEMICALLY, AND OPTICALLY SATISFACTORY FOR OPTICAL SENSOR COMPONENTS AND WINDOWS. HOWEVER, IT IS COMPLETELY IMPRACTICAL AS A MATERIAL FOR ANY BUT THE SMALLEST WINDOWS. AS A RESULT OF RECENT RESEARCH, DIAMOND CAN NOW BE PRODUCED AS A COATING, GIVING THE OPTION OF COATING STANDARD OPTICAL COMPONENTS WITH DIAMOND IN THE FORM OF A CONTINUOUS LAYER. THIS RETAINS THE STRUCTURAL AND OPTICAL PROPERTIES OF THE ORIGINAL WINDOW, BUT ADDS A SURFACE PROTECTIVE COATING WHICH IS INFRARED, TRANSPARENT, HARD, SCRATCH, RESISTANT, AND CHEMICALLY INERT. DURING THE INITIAL RESEARCH PHASE, DIAMOND FILMS WERE DEPOSITED ON SAPPHIRE AND SILICON, AND DIAMOND DEPOSITION PROCESSES WERE STUDIED FOR APPLICATION TO OTHER MATERIALS. IN CURRENT RESEARCH EFFORT, THE PROCESS IS BEING DEVELOPED INTO A PRACTICAL DEPOSITION METHOD CAPABLE OF COVERING LARGE AREA OPTICAL COMPONENTS. DEPOSITION ON BOTH SAPPHIRE AND OTHER INFRARED MATERIALS SUCH AS THE HALIDES IS BEING DEVELOPED.

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SUCCESSFUL DEVELOPMENT OF COATINGS OF THIS TYPE WOULD ENABLE PROTECTION OF OPTICAL COMPONENTS USED IN A WIDE VARIETY OF INFRARED SENSOR APPLICATIONS.

IRVINE SENSORS CORP
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CONTRACT NUMBER:
MARTIN SPANISH
TITLE:
ON-FOCAL PLANE ANALOG TO DIGITAL CONVERSION
TOPIC# 3 OFFICE: IDENT#: 241

DIGITIZING SENSOR OUTPUT SIGNALS BEFORE TRANSMITTING THEM OFF THE COLD FOCAL PLANE ASSEMBLY (FPA) WOULD RESULT IN AVOIDANCE OF ELECTROMAGNETIC INTERFERENCE (EMI), REDUCED NUCLEAR RADIATION SUSCEPTIBILITY, HIGHER DATA RATE CAPACITY, AND THE POTENTIAL FOR SUBSTANTIAL DATA COMPRESSION. ON-FOCAL PLANE ANALOG-TO-DIGITAL CONVERSION PREVIOUSLY HAS BEEN STYMIED BY EXCESSIVE POWER DISSIPATION THAT OVERLOADS THE FPA COOLING SYSTEM. A WAY TO OVERCOME THIS OBSTACLE IS BEING INVESTIGATED BY PERFORMING THE ANALOG-TO-DIGITAL CONVERSION ON A PER DETECTOR CHANNEL BASIS, PRIOR TO MULTIPLEXING, USING A PROPRIETARY HYBRID MOSAIC ON STACKED SILICON (HYMOSS) FPA PACKAGING TECHNOLOGY. CONVENTIONAL ANALOG-TO-DIGITAL CONVERTERS (ADC'S) OPERATE AT HIGH DATA RATES ON THE MULTIPLEXED SIGNALS FROM MANY DETECTOR CHANNELS, RESULTING IN HIGH POWER DISSIPATION REQUIREMENTS. THE PARALLEL ADC APPROACH BEING EMPLOYED OPERATES AT FREQUENCIES THAT ALLOW THE APPLICATION OF VERY LOW POWER ADC DESIGNS. IN THE EARLIER RESEARCH PHASE, THE FEASIBILITY OF THIS DESIGN CONCEPT FOR ON-FOCAL PLANE DIGITIZATION WAS DETERMINED. IN ADDITION, THE PRELIMINARY DESIGN OF AN INTEGRATED CIRCUIT THAT COULD BE IMPLEMENTED IN HYMOSS TO READ OUT HIGH DENSITY, MOSAIC IR FPA'S WAS COMPLETED. IN CURRENT RESEARCH EFFORT, AN ADC TEST IC IS BEING DESIGNED, FABRICATED, AND TESTED IN BULK COMPLEMENTARY METAL OXIDE SEMICONDUCTOR CAPABLE OF BEING INTEGRATED INTO THE 128 CHANNEL HYMOSS TEST IC.

IRVINE SENSORS CORP
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CONTRACT NUMBER:
MARTIN SPANISH
TITLE:
APPLICATION OF HYMOSS/DYNAMIC STARE TO LIGHTWEIGHT
EXO-ATMOSPHERIC PROJECTILE FAST FRAME SEEKERS
TOPIC# 2 OFFICE: IDENT#: 485

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IN THE PREVIOUS RESEARCH PHASE, THE MISSILE SEEKER APPLICATION OF A DYNAMIC STARE SENSOR WAS INVESTIGATED, PARTICULARLY FOR LIGHTWEIGHT EXO-ATMOSPHERIC PROJECTILES. A DYNAMIC STARE SENSOR IS A SCANNER WITH MOTION STABILIZED FULL FRAME MEMORY IN WHICH BANDPASS FILTERS OPERATE ON BOTH THE SCANNING DETECTOR OUTPUTS AND ON MANY FRAMES OF DATA ASSOCIATED WITH EACH SCANNED PICTURE ELEMENT. THE COMBINATION OF FILTERS USED HAS PROVEN EFFECTIVE AT ACQUIRING AND TRACKING DIM TARGETS IN A HIGH LEVEL OF CLUTTER FROM MOVING PLATFORMS. AN INTEGRATED CIRCUIT (IC) BASED ON LIGHTWEIGHT EXO-ATMOSPHERIC PROJECTILE REQUIREMENTS WAS CONFIGURED IN THE PREVIOUS PHASE. THIS IC, INTEGRATED IN A HYBRID MOSAIC ON STACKED SILICON (HYMOSS) FOCAL PLANE MODULE, IS EXPECTED TO IMPROVE PERFORMANCE IN ACQUISITION RANGE IN THE PRESENCE OF CLUTTER AND MISSILE-INDUCED LINE-OF-SIGHT MOTION, UPDATE RATES, AND TARGET FEATURE EXTRACTION. IN THE CURRENT RESEARCH EFFORT, THE DETAILED DESIGN OF THE TEST IC IS BEING COMPLETED; AND IC CONTAINING THE CRITICAL FUNCTIONS IS BEING FABRICATED; AND ITS PERFORMANCE UNDER TYPICAL DYNAMIC STARE SCENARIOS IS BEING VERIFIED. WHEN SUCCESSFULLY DEVELOPED, DYNAMIC STARE WOULD OPERATE WITH A FULLY OR PARTIALLY POPULATED FOCAL PLANE, AND IN ONE OR MORE SPECTRAL REGIONS. IT WOULD PROVIDE ADVANTAGES IN BOTH EARTH AND STELLAR BACKGROUNDS AND FOR BOTH SURVEILLANCE AND MISSILE SEEKER PLATFORMS.

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PAUL ZAVRACKY
TITLE:

SURFACE MORPHOLOGY OF SILICON ON INSULATOR FILMS PREPARED BY
ZONE-MELTING RECRYSTALLIZATION

TOPIC# 14 OFFICE: IDENT#: 383

IN THE PREVIOUS RESEARCH PHASE, THE ZONE-MELT RECRYSTALLIZATION (ZMR) METHOD WAS INVESTIGATED FOR SILICON-ON-INSULATOR (SOI) FORMATION FOR IMPROVED RADIATION-HARD ELECTRONIC DEVICES. THE ZMR METHOD USES A THIN FILM OF POLYCRYSTALLINE SILICON DEPOSITED ON AN OXIDE-COATED SILICON WAFER WHICH IS RECRYSTALLIZED USING A SCANNED HEATING

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TECHNIQUE. IT WAS PREVIOUSLY DEMONSTRATED THAT THE SURFACE MORPHOLOGY OF SUCH FILMS COULD BE IMPROVED BY SEVERAL ADJUSTMENTS TO THIS RECRYSTALLIZATION PROCESS. THE FEASIBLE METHODS OF CONTROLLING SURFACE MORPHOLOGY OF SOI FILMS PREVIOUSLY IDENTIFIED ARE BEING INVESTIGATED IN GREATER DEPTH IN THE CURRENT RESEARCH EFFORT TO OBTAIN FILMS OF IMPROVED QUALITY. AT THE END OF THE CURRENT EFFORT, THE SOI FILMS ARE EXPECTED TO PROVIDE A DESIRABLE ALTERNATIVE TO STANDARD SUBSTRATES FOR THE MANUFACTURE OF SUPERIOR RADIATION-HARD CIRCUITS. THIS RESEARCH IS INTENDED TO YIELD SOI STRUCTURES WITH REDUCED BOW AND WARP, MINIMAL PROTRUSIONS, AND A HIGH-DEGREE OF THICKNESS UNIFORMITY FOR WHICH APPLICATIONS EXISTS IN A WIDE RANGE OF MILITARY AND DOMESTIC ELECTRONICS SYSTEMS.

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RONALD P GALE

TITLE:

DUAL SUSCEPTOR ORGANOMETALLIC CHEMICAL VAPOR DEPOSITION FOR
PRODUCTION OF HETEROSTRUCTURE MATERIALS

TOPIC# 14 OFFICE: IDENT#: 489

A NEW GENERATION OF ELECTRONIC AND PHOTONIC DEVICES REQUIRES ADVANCED HETEROSTRUCTURES. THE LARGE-SCALE PRODUCTION OF HIGH ELECTRON MOBILITY TRANSISTORS AND QUANTUM-WELL OPTOELECTRONIC DEVICES REQUIRES THE DEPOSITION OF ATOMICALLY ABRUPT LAYERS OF GALLIUM ARSENIDE AND RELATED III-V MATERIALS UNIFORMLY OVER LARGE AREAS. SPECIFICALLY, A NEW TYPE OF ORGANOMETALLIC CHEMICAL VAPOR DEPOSITION (OMCVD) REACTION CHAMBER IS BEING DEVELOPED AND DEMONSTRATED THAT OFFERS SUPERIOR UNIFORMITY AND ABRUPTNESS, AND REDUCED GROWTH TEMPERATURE. IN EARLIER RESEARCH PHASE, FEASIBILITY OF THE REACTOR DESIGN WAS DEMONSTRATED. IN THE CURRENT RESEARCH EFFORT, A PRODUCTION-SCALE DUAL-SUSCEPTOR REACTOR CAPABLE OF DEPOSITING GaAs ON SIX THIN WAFERS SIMULTANEOUSLY IS BEING CONSTRUCTED AND OPERATED. WHEN SUCCESSFUL, THE REACTOR WOULD OFFER PRODUCTION-SCALE DEPOSITION OF THE DESIRED ELECTRONIC FILMS AND WOULD DEPOSITE LAYERS WITH SUPERIOR UNIFORMITY AND ABRUPTNESS THAN CAN BE OBTAINED WITH MOLECULAR BEAM EPITAXY OR OTHER CHEMICAL VAPOR DEPOSITION APPROACHES.

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L.N.K. CORP INC
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CONTRACT NUMBER:
DR JOSEPH CRAIG
TITLE:
A NEURAL NETWORK SYSTEM BASED ON LIE GROUP THEORY FOR MULTIPLE
OBJECT RECOGNITION AND TRACKING
TOPIC# 10 OFFICE: IDENT#: 388

A NEURAL NETWORK SYSTEM IS BEING DESIGNED AND DEVELOPED CAPABLE OF PERFORMING BASIC TIME-VARYING, THREE-DIMENSIONAL (3D) SCENE ANALYSIS AND MULTIPLE OBJECT RECOGNITION/DISCRIMINATION AND TRACKING. RESEARCH IN THE PREVIOUS PHASE HAS DEMONSTRATED THAT THE CAPABILITY FOR ADDRESSING "UNIVERSALS", WHICH ARE INVARIANT UNDER DESIGNATED TRANSFORMATION GROUPS, CAN BE ACHIEVED BY A PREWIRED NEURAL NETWORK DESIGN BASED ON LIE GROUP THEORY. THE LIE-WIRING NETWORK IS A GENERAL PURPOSE IMAGE TRANSFORMER ACCORDING TO 3D RIGID MOTION. BASED ON THE FINDINGS OF THAT RESEARCH, SIMULATORS OF VARIOUS NEURAL PROCESSES ARE BEING BUILT THAT WOULD BE INVOLVED IN TIME VARYING 3D DYNAMIC SCENE ANALYSIS, SUCH AS MOTION INVARIANT FEATURE DETECTION, SHAPE CONGRUENCE VERIFICATION, SEGMENTATION BASED ON THE COMMON FATE LAW OF GESTALT, MOTION PARAMETER ESTIMATION, OBJECT RECOGNITION/DISCRIMINATION AND TRACKING. THE TESTS ARE BEING CONDUCTED ON A MASSIVELY PARALLEL COMPUTER AT A REAL-LIFE PROBLEM LEVEL TO DETERMINE THE OPTIMAL PARAMETERS OF THE LIE WIRING, DYNAMIC PATTERN MATCHING, AND OTHER COMPONENTS OF THE SYSTEM. ALONG WITH EXPERIMENTAL TESTS AND THEORETICAL ANALYSES, THE NEURAL NETWORK DESIGN IS BEING REFINED THAT WILL LEAD TO A LIE GROUP THEORY BASED ON NEURAL HARDWARE SYSTEM. THE LIE-WIRING NETWORK SYSTEM HAS THE POTENTIAL FOR A ADDITIONAL APPLICATIONS IN GEOMETRIC IMAGE CORRECTION, IMAGE MAPPING, AND REAL-TIME COMPUTER GRAPHICS AND DISPLAY.

MAINSTREAM ENGINEERING CORP
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DR R P SCARINGE
TITLE:
HEAT PUMP AUGMENTED SPACECRAFT HEAT REJECTION SYSTEM
TOPIC# 7 OFFICE: IDENT#: 93

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DEFENSE SPACE MISSIONS WILL INTRODUCE SIGNIFICANT NEW TECHNOLOGICAL NEEDS FOR SPACECRAFT ENERGY SYSTEMS. HEAT-PUMP-AUGMENTED SPACECRAFT HEAT REJECTION SYSTEMS HAVE THE POTENTIAL TO REDUCE RADIATOR SIZE AND SYSTEM WEIGHT. THE PREVIOUS RESEARCH EFFORT HAS IDENTIFIED A SERIES OF WORKING FLUIDS THAT ARE SUPERIOR TO EXISTING WORKING FLUIDS AND IDENTIFIED FOUR PROMISING HEAT PUMP CONFIGURATIONS (TWO THERMALLY DRIVEN AND TWO ELECTRICALLY DRIVEN) THAT REQUIRE FURTHER DETAILED EXPERIMENTAL ANALYSIS. IN THE CURRENT RESEARCH PHASE, EXPERIMENTAL TESTING OF THE STABILITY, LUBRICATION QUALITY, AND THERMODYNAMIC PERFORMANCE OF THESE WORKING FLUIDS IS BEING PERFORMED. IN ADDITION, PROTOTYPES OF THE FOUR HEAT-PUMP CONFIGURATIONS ARE BEING DESIGNED, BUILT, AND TESTED IN NORMAL GRAVITY TO DETERMINE BOTH THE BEST THERMALLY DRIVEN AND BEST ELECTRICALLY DRIVEN HEAT PUMP CONFIGURATION FOR THE VERY STRINGENT SPACE CRAFT REQUIREMENTS (HIGH RELIABILITY, LOW WEIGHT, HIGH PERFORMANCE, AND ACCOMODATION OF HIGHLY VARIABLE DUTY CYCLES). EXPERIMENTAL VALIDATION OF THE PROPOSED INNOVATIONS ARE BEING PROVIDED AS ARE HARD NUMBERS FOR THE MASS, SIZE, AND PERFORMANCE OF EACH OF THE PROPOSED SYSTEMS (AND FLUIDS). THIS EFFORT IS EXPECTED TO DEMONSTRATE THAT THE PROPOSED HEAT PUMP CONCEPTS HAVE SIGNIFICANT BENEFITS IN TERMS OF REDUCED WEIGHT, INCREASED RELIABILITY, AND INCREASED OPERATIONAL FLEXIBILITY.

MATERIALS MODIFICATIONS INC
2946 SLEEPY HOLLOW RD - STE 2H
FALLS CHURCH, VA 22044

CONTRACT NUMBER:

DR T S SUDARSHAN

TITLE:

SOLID LUBRICANTS FOR SPACE STRUCTURES

TOPIC# 13

OFFICE:

IDENT#:

95

A TECHNIQUE FOR PRODUCING FINELY DISPERSED LEAD IN COPPER ALLOYS, AT PERCENTAGES UP TO 45%, HAS BEEN DEMONSTRATED, AND LIMITED CHARACTERIZATION ACCOMPLISHED. A PROCESSING TECHNIQUE IS BEING REFINED WHICH USES GAS ATOMIZATION FORMATION OF POWDERS, AND PRODUCT FORMATION THROUGH SINTERING AND EXPLOSIVE COMPACTION. THE RESULTANT HIGH LEAD ALLOY WILL BE CHARACTERIZED FULLY FOR DEFORMATION, LUBRICATION, AND CORROSION BEHAVIOR. THE TECHNIQUE CAN BE READILY

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ADAPTED FOR COMMERCIAL MANUFACTURE OF SELF-LUBRICATING BUSHINGS AND BEARINGS FOR APPLICATION IN ALL KINDS OF MOVING MECHANICAL ASSEMBLIES. AUTOMOTIVE VEHICLES, MANUFACTURING TOOLS AND MACHINES, TRANSPORTATION VESSELS, TEXTILE AND PAPER INDUSTRIES, ARE BUT A FEW EXAMPLES. OTHER APPLICATIONS INCLUDE SATELLITES, ANTENNAS, GIMBAL AND SOLAR MECHANISMS, WASHERS, SUSPENSION IN OILS/GREASES, FUEL PUMPS IN AEROSPACE ENGINES, BATTERY GRIDS FOR SUBMARINES OR HEAVY LOADING EQUIPMENT, SOUND ABSORPTION MATERIALS FOR RADAR AND SONAR DEVICES AND ANODES FOR SPUTTERING TARGETS.

MERCURY LPE CO INC
193 DEBORAH LYNN CT
CHESWICK, PA 15024
CONTRACT NUMBER:
DAVID G. RYDING
TITLE:
HgCdTe AND HgZnTe LPE ON LATTICE MATCHED CdZnTe SUBSTRATES
TOPIC# 14 OFFICE: IDENT#: 574

GROWTH OF HgZnTe LPE WITH X-RAY ROCKING CURVE MEASUREMENTS AS LOW AS 50 ARC SECONDS WITH FAVORABLE HALL MEASUREMENTS. IT HAS BEEN DEMONSTRATED THAT HgZnTe MAY BE SUPERIOR TO HgCdTe. MERCURY CO. IS THE FIRST TO REPORT CAPABILITY OF PRODUCING LARGE AREA HgZnTe. GALTECH SEMICONDUCTOR MATERIALS DELIVERED LARGE AREA LATTICE MATCHED Cd(.8)An(.2)Te SUBSTRATES THAT HAD X-RAY ROCKING CURVE MEASUREMENTS AS LOW AS 19 ARC SECONDS. IT WAS GALTECH'S SECOND CRYSTAL OF THIS COMPOSITION. SUBSTRATES, EPITAXY, AND INFRARED DETECTORS WILL BE DEVELOPED IN PHASE II. SUBSTRATES WILL BE DEVELOPED FOR THE BEST LATTICE MATCH AND THE SIZE, CRYSTALLINE QUALITY AND IMPURITIES OF BOTH THE SUBSTRATES AND EPITAXY WILL BE IMPROVED AND MAPPED USING X-RAY ROCKING CURVES, FTIR, AND EPD MEASUREMENTS TO CORRELATE RESULTS TO IR DETECTOR PERFORMANCE. N AND p-TYPE EPITAXY WILL BE ATTEMPTED AND IF SUCCESSFUL, MULTI-LAYER GROWTHS. AMBER ENGINEERING, INC. WILL DEVELOP IR DETECTORS AND HYBRIDIZE THESE TO X-Y ADDRESSED SILICON READOUTS. IN PHASE III, MERCURY LPE WILL PRODUCE AND SELL HIGH QUALITY, LOW COST HgCdTe AND HgZnTe MWIR WAFERS. GALTECH SEMICONDUCTOR MATERIALS WILL MARKET HIGH QUALITY LATTICE MATCHED CdTe FAMILY SUBSTRATES. AMBER ENGINEERING WILL MARKET MWIR DETECTOR ARRAYS WHICH WILL BE CHARACTERIZED IN TERMS OF OPERABILITY, R(0)A

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VERSUS TEMPERATURE, AND QUANTUM EFFICIENCY, AND HYBRIDIZED TO
SILICON X-Y ADDRESSABLE READOUTS. PHASE-I OF THIS PROJECT FUNDED BY
THE AIR FORCE.

MISSION RESEARCH CORP
3505 CADALLIC AVE - BLDG H
COSTA MESA, CA 92626
CONTRACT NUMBER:
DR STEVE F STONE
TITLE:
ENHANCED LETHALITY/HARDENING FOR HYPERVELOCITY IMPACTS
TOPIC# 9 OFFICE: IDENT#: 257

A SIMULATION MODEL HAS BEEN DEVELOPED FOR KINETIC ENERGY WEAPONS
(KEW) ANALYSIS AND DESIGN, WHICH IS NOT BASED ON TRADITIONAL
EMPIRICAL, DATA-SPECIFIC APPROACHES. THE MODEL IS BEING REFINED
AND WILL BE EVALUATED FOR USE IN LETHALITY AND HARDENING OPTIMIZATION
DESIGN CODE WILL BE EXERCISED IN SELECTING KEW PROJECTILES AND
IMPACT PATTERNS, AND IS DESIGN OF AN RV SHELL HARDENED AGAINST KEW.
THE PREDICTIVE CODE WILL HAVE APPLICATION FOR DESIGN OF BOTH
PROJECTILE AND ARMOR PROTECTION FOR SPACE AND LAND BASED SYSTEMS.
POTENTIAL OTHER APPLICATIONS MAY EXIST FOR DESIGN OF CONVENTIONAL
AMMUNITION AND FOR DEVELOPMENT OF ADVANCED BODY ARMOR TO PROTECT
AGAINST HIGH VELOCITY AMMUNITION.

OPTIVISION INC
744 SAN ANTONIO RD - STE 10
PALO ALTO, CA 94303
CONTRACT NUMBER:
ALEXANDER A SAWCHUK
TITLE:
OPTICAL BUS EXTENDERS FOR HIGH SPEED COMPUTERS
TOPIC# 11 OFFICE: IDENT#: 304

OPTICAL BUS EXTENDERS OFFER A MEANS FOR HIGH-SPEED INTERCONNECTION OF
COMPUTING SYSTEM MODULES DISTRIBUTED AT DISTANCES GREATER THAN A VERY
FEW METERS. A BUS EXTENDER, AS OPPOSED TO A FIBER OPTIC COMMUNICATION

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CHANNEL OR A LOCAL AREA NETWORK SEGMENT, ALLOWS COMMUNICATION OVER SEVERAL PARALLEL CHANNELS SIMULTANEOUSLY, COMMUNICATES THE BUS STATE TO OTHER MODULES, AND ALLOWS DATA TRANSFER BETWEEN TWO PROCESSORS IN A MASTER-TO-MASTER MODE, ENHANCING THE PERFORMANCE OF DISTRIBUTED COMPUTING ENVIRONMENTS. A HIGH-SPEED FIBER OPTIC BUS EXTENDER IS BEING DEVELOPED FOR THE VMEBUS (THE MOST COMMON HIGH PERFORMANCE COMPUTER BUS). THIS INTERCONNECTOR DEVICE IS EXPECTED TO ALLOW DATA TRANSFER BETWEEN TWO VMEBUS-BASED MACHINES AT DISTANCES UP TO 2Km (WITHOUT REPEATERS) AND AT RATES UP TO 40 MBYTES IN INCREMENTS OF 10 MBYTES BY ADDING UP TO FOUR PARALLEL FIBER-OPTIC CHANNELS. THE ARCHITECTURE IS BEING DESIGNED TO OPTIMIZE THE PRICE-PERFORMANCE TRADEOFFS FOR THE VMEBUS SPECIFICATIONS. THE CONCEPT OFFERS THE POTENTIAL FOR THE DESIGN OF FIBER-OPTIC BACKPLANES USEFUL FOR HIGH SPEED DATA TRANSFER BETWEEN COMPONENTS OF A SINGLE MACHINE THAT MAY BE SEPARATED BY SIGNIFICANT DISTANCES. APPLICATIONS FOR THIS DEVICE, WHEN SUCCESSFULLY DEMONSTRATED, WOULD BE IN CONNECTION OF SUPER-COMPUTERS AND HIGH-SPEED DISKS TO ENGINEERING WORKSTATIONS AND COLLECTION OF DATA AT HIGH SPEED FROM DISTRIBUTED SENSORS SUCH AS PHASED ARRAY RADARS.

OPTRON SYSTEMS INC
3 PRESTON CT
BEDFORD, MA -1730
CONTRACT NUMBER:
DR IRA FARBER
TITLE:

SCANNING ELECTRON READOUT IMAGING DETECTOR
TOPIC# 11 OFFICE: IDENT#: 507

CURRENTLY, ALL-OPTICAL COMPUTERS ARE LIMITED IN PERFORMANCE AND UTILITY BECAUSE NO EXISTING NONLINEAR LIGHT MODULATION DEVICE SIMULTANEOUSLY OFFERS FAST OPTICAL SWITCHING WITH THRESHOLD, HIGH GAMMA, HIGH SPATIAL BANDWIDTH, LOW POWER DISSIPATION, OPTICAL GAIN, AND HIGH RELIABILITY. IN A PREVIOUS RESEARCH PHASE, THE FEASIBILITY WAS DEMONSTRATED OF DEVELOPING A NEW CLASS OF A HIGH-SENSITIVITY, HIGH-RESOLUTION, VERY HIGH SPEED IMAGING DETECTORS (INTENSIFIED BISTABLE OPTICAL DEVICES-IBODs) BASED ON A TWO-DIMENSIONAL ARRAY OF FAST, OPTICALLY TRIGGERED LIGHT SWITCHES PROVIDING LOW OPTICAL SWITCHING POWER AND FAST SWITCHING SPEED. THIS IMAGE SYSTEM CONSISTS

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OF TWO ELECTRONIC IMAGING DEVICES THAT SHARE A HIGH-RESOLUTION ANODE: THE FRONT END OF THE SYSTEM IS AN INTENSIFIED TWO-DIMENSIONAL IMAGING DETECTOR (CONSISTING OF A PHOTOCATHODE AND MICROCHANNEL PLATES) AND THE BACK-END IS THE SCANNING ELECTRON READOUT ANODE (CONSISTING OF THE HIGH-RESOLUTION ANODE, AN ELECTRON COLLECTION GRID AND FAST-SCANNING, FINELY-FOCUSSED ELECTRON GUN THAT ADDRESSES THE ANODE). IN THE CURRENT RESEARCH EFFORT, SUCH OPTICAL SIGNAL PROCESSING DEVICES ARE BEING DEVELOPED. WHEN SUCCESSFULLY DEVELOPED, THE IBOD WOULD PROVIDE A LOW-COST, HIGH RESOLUTION, MASSIVELY PARALLEL OPTICAL SWITCH WITH VARIABLE THRESHOLD AND SATURATION INTENSITIES. SUCH A DEVICE WOULD HAVE APPLICATIONS IN OPTICAL NEURAL NETWORKS, OPTICAL SIGNAL PROCESSING, OPTICAL COMPUTING, MACHINE VISION AND INDUSTRIAL INSPECTION.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE A
TORRANCE, CA 90505

CONTRACT NUMBER:

DR TOMASZ JANNSON

TITLE:

HIGHLY-PARALLEL HOLOGRAPHIC INTEGRATED PLANAR INTERCONNECTIONS

TOPIC# 11

OFFICE:

IDENT#: 309

HIGHLY-PARALLEL HOLOGRAPHIC INTEGRATED PLANAR INTERCONNECTS HAVE BEEN INVESTIGATED IN A PREVIOUS RESEARCH PHASE AS A UNIQUE SOLUTION TO THE REQUIREMENTS TO COMBINE LARGE PARALLELITY, RECONFIGURABILITY, AND FULL PARALLELISM OF OPTOELECTRONIC PROCESSORS WITH THE COMPACTNESS, RUGGEDNESS, ACCURACY, LOW CROSS-TALK, LOW INSERTION LOSS, AND MECHANICAL STABILITY REQUIRED IN MOST STRATEGIC DEFENSE ELECTRONIC SYSTEMS. THESE HOLOGRAPHIC PLANAR INTERCONNECTS ARE BASED ON THE MULTIPLEXED PLANAR HOLOGRAMS WHICH, THOUGH MADE ON THIN WAVEGUIDE SUBSTRATES, ARE IN FACT THICK IN THE THEORETICAL SENSE OF BRAGG HOLOGRAMS, DUE TO THE LONG INTERACTION PATCH LENGTH OF THE ZIGZAG GUIDED WAVES WITH THE PLANAR HOLOGRAPHIC GRATINGS. IN THE CURRENT RESEARCH PHASE, 100-CHANNEL SINGLE-MODE-MONOLITHIC HOLOPLANAR INTERCONNECT DEVICES ARE BEING DEMONSTRATED. WITH THEIR SUPERIOR EFFICIENCY, INSERTION LOSS, CROSS-TALK, COMPACTNESS AND RUGGEDNESS, THESE HOLOPLANAR INTERCONNECTS, WHEN SUCCESSFULLY DEMONSTRATED, WOULD BE APPLICABLE TO VERY LARGE SCALE INTEGRATED CHIP-TO-CHIP

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INTERCONNECTS, NEUROCOMPUTERS AND HYPER-CUBE COMPUTERS.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE A
Torrance, CA 90505

CONTRACT NUMBER:

DR TOMASZ JANNSON

TITLE:

LASER COUNTERMEASURE HOLOGRAPHIC RUGATE FILTERS FOR ULTRAVIOLET
RADIATION

TOPIC# 8

OFFICE:

IDENT#: 310

SEVERAL SDI SYSTEMS ARE CURRENTLY PROJECTING THE USE OF UV/VISIBLE AND NEAR IR SENSORS. UV HAS GREAT POTENTIAL FOR REDUCING SYSTEM COST SINCE A PASSIVE UV OPTICAL SYSTEM IS INHERENTLY LIGHTER IN WEIGHT, SMALLER, AND THEREFORE LOWER IN LAUNCH COST THAN AN IR SYSTEM OF EQUIVALENT RESOLUTION. SDI MUST ALSO CONSIDER HOW TO PROTECT OR COUNTERMEASURE THESE SYSTEMS FROM ENEMY LASER THREATS. PHASE I FABRICATION UV HOLOGRAPHIC FILTERS WITH GOOD OPTICAL QUALITIES WHICH SHOULD FIND APPLICATION TO MANY SDI SYSTEMS SUCH AS THE SPACE-BASED INTERCEPTOR AND COUNTERMEASURES. PHYSICAL OPTICS CORPORATION HAS BEEN ABLE TO FABRICATE UV HOLOGRAPHIC FILTERS WITH OPTICAL DENSITY AS HIGH AS SIX, WITH REFLECTIVITY IN EXCESS OF 99.9%, AND WITH EXTREMELY LOW ABSORPTION. LASER DAMAGE THRESHOLDS OF THESE FILTERS/MIRRORS HAVE BEEN MEASURED TO BE 0.87GW/cm², WITH TEMPERATURE STABILITY IN EXCESS OF 200 DEGREES CELSIUS FOR LONG PERIODS OF TIME (HOURS). IN ADDITION, POC WAS ABLE TO DEMONSTRATE A FREQUENCY DOUBLED AND TRIPLED RECORDING TECHNIQUE SUCH THAT A SINGLE HOLOGRAM COULD REFLECT BOTH THE FUNDAMENTAL LINE (690nm) AND ITS FREQUENCY DOUBLE LINE (345nm). THIS HAS APPLICATIONS TO FREQUENCY DOUBLED AND TRIPLED Nd-YAG SYSTEMS. THESE UV HOLOGRAPHIC FILTERS APPEAR TO BE MASS PRODUCIBLE EVEN IN LARGE SIZES (ft²) COMPATIBLE WITH INEXPENSIVE SUBSTRATES AND PROMISE TO BE LOW IN COST. THEY CAN ALSO PERFORM MANY OPTICAL PROCESSING FUNCTIONS WHICH DIELECTRIC MULTILAYERS CANNOT PERFORM. THE COATINGS SEEM HIGHLY AMENABLE TO SIMPLE PRODUCTION TECHNIQUES. ALSO, THE TECHNIQUES PROPOSED FOR FILTER DEVELOPMENT CAN BE EXTENDED TO THE NEAR IR REGION.

POTOMAC PHOTONICS INC

4720-E BOSTON WY

LANHAM, MD 20706

CONTRACT NUMBER:

C PAUL CHRISTENSEN

TITLE:

ULTRAVIOLET WAVEGUIDE LASERS FOR PHASED ARRAY LIDAR

TOPIC# 3

OFFICE:

IDENT#: 117

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STUDIES HAVE SHOWN THAT ULTRAVIOLET WAVEGUIDE LASER PHASED ARRAYS MAY BE AMPLIFIED WITHOUT DEGRADING COHERENCE AND CAN BE EASILY INJECTION LOADED, MAKING SUITABLE FOR RADAR APPLICATIONS. ADDITIONALLY, THEY ARE CHARACTERIZED BY EFFICIENT HIGH REPETITION RATES WITH LONG OPTICAL PULSE DURATION. IN THIS PROJECT, SMALL TWO DIMENSIONAL XENON-CHLORIDE (XeCl) LASER ARRAYS, EXCITED BY ELECTRODELESS MICROWAVE DISCHARGES, ARE BEING CONSTRUCTED AND TESTED. THE SMALL ARRAYS WILL BE USED TO DEMONSTRATE POWER SCALING, PHASE-LOCKED OPERATION, AND INDEPENDENT PHASE CONTROL OF ARRAY ELEMENTS. IN ADDITION TO RADAR, WAVEGUIDE EXCIMER LASER ARRAYS HAVE POTENTIAL APPLICATION IN MATERIALS PROCESSING, DIRECT WRITE PATTERNING OF SEMICONDUCTOR MATERIALS, MICROFABRICATION, LASER SURGERY, AND ANALYTIC INSTRUMENTATION.

RASOR ASSOCS INC
253 HUMBOLDT CT
SUNNYVALE, CA 94089

CONTRACT NUMBER:

DR JEAN-LOUIS DESPLAT

TITLE:

OXYGEN CONTROL FOR THERMIONIC CONVERTERS

TOPIC# 4

OFFICE:

IDENT#: 558

TO IMPROVE PERFORMANCE OF A THERMIONIC CONVERTER, OXYGEN MAY BE DISPENSED DIRECTLY AT THE EMITTER. TO CONTROL THE OXYGEN, A DESIGN HAS BEEN COMPLETED USING AN OXYGEN ION-CARRYING SOLID ELECTROLYTIC CELL INTEGRATED WITH THE COLLECTOR. THE FABRICATION OF A THERMIONIC CONVERTER, WHICH COMBINES THE COLLECTOR AND OXYGEN ELECTROLYTIC DISPENSER (COED) INTO ONE STRUCTURE, IS BEING ACCOMPLISHED USING THORIA BASED SOLID ELECTROLYTES IN AN OXIDATION RESISTANT, VACUUM TIGHT, BRAZED KOVAR-THORIA STRUCTURE. TWO DESIGNS ARE BEING BUILT AND TESTED. THE TEST RESULTS WILL ESTABLISH A DATA BASE OF OXYGEN ENHANCED PERFORMANCE, AND ESTABLISH CORRELATION BETWEEN THE OXYGEN ENHANCEMENT AND OXYGEN ACTIVITY INSIDE A THERMIONIC CONVERTER. THE PRIMARY APPLICATION OF THE THERMIONIC CONVERTER IS FOR IN-CORE SPACE POWER REACTORS. ADDITIONAL COED APPLICATIONS INCLUDE LONGER-LIVED COMMERCIAL POWER PLANTS, WITH MORE EFFICIENT CONVERSION OF HEAT TO ELECTRICITY.

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RUPPRECHT & PATASHNICK CO INC
8 CORPORATE CIR
ALBANY, NY 12203
CONTRACT NUMBER:
DR GEORGE RUPPRECHT
TITLE:
REAL TIME MASS LOSS INSTRUMENTATION FOR LASER STUDIES
TOPIC# 9 OFFICE: IDENT#: 127

THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP A MASS MEASUREMENT SYSTEM CAPABLE OF HIGH MASS RESOLUTION IN THE MILLISECOND TIME INTERVAL BETWEEN LASER IMPULSES. THE APPROACH IS AN OUTGROWTH OF TEOM (TM) TECHNOLOGY AND USES OF PROPRIETARY MASS MEASUREMENT SYSTEM CALLED A "LINEAR MOTION BALANCE". THIS SYSTEM INTRODUCES A FOURFOLD SYMMETRY AND EFFECTIVELY ATTENUATES THE PROBLEMS FOUND WITH CONVENTIONAL GRAVITY OR INERTIAL BALANCE SYSTEMS, SUCH AS HIGHER ORDER VIBRATION AND POSITIONAL CHANGES WITH RESPECT TO THE TARGET AREAS. SUCCESSFUL DEVELOPMENT OF THIS SYSTEM WILL PROVIDE A RESEARCH TOOL PRESENTLY UNAVAILABLE. THE SYSTEM CAN BE USED IN AIR OR VACUUM DEVELOPMENT OF LASER AND TARGET MATERIALS. POTENTIAL APPLICATIONS ARE FOR QUICK, ACCURATE MASS MEASUREMENT IN LABORATORIES.

SAT-CON TECHNOLOGY CORP
71 ROGERS ST
CAMBRIDGE, MA 02142
CONTRACT NUMBER:
R HOCKNEY
TITLE:
SUPERCONDUCTING MAGNETIC BEARINGS FOR HIGH PERFORMANCE
MOMENTUM-EXCHANGE EFFECTOR
TOPIC# 1 OFFICE: IDENT#: 569

A SUPERCONDUCTING TORQUER BEING BUILT USES SUPERCONDUCTING SOURCE COILS AND HIGH-PURITY CRYORESISTIVE ALUMINUM (HYPERCONDUCTORS) CONTROL COILS TO FORM AN ADVANCED MAGNETIC SUSPENSION SYSTEM. THIS SINGLE-AXIS POSITION SERVO TORQUER WILL HAVE AN ORDER OF MAGNITUDE

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GREATER OUTPUT THAN CONVENTIONAL SERVO TORQUERS. IN ADDITION, CONVENTIONAL TORQUES USING BALL BEARINGS TRANSMIT NOISE AND VIBRATION WHICH THE MAGNETIC SUSPENSION ALLEVIATES. THE TORQUE HAS MANY APPLICATIONS FOR SERVO CONTROL IN SPACECRAFT, AND POTENTIALLY IN AIRCRAFT, SHIPS, AND OTHER VEHICLES. THE MAGNETIC BEARING SUSPENSION CAN BE USEFUL IN MANY APPLICATIONS, INCLUDING SPACE ASTRONOMY, WEAPONS PLATFORMS, RESEARCH VEHICLES, SATELLITE COMMUNICATIONS SYSTEMS, ETC.

SAT-CON TECHNOLOGY CORP

71 ROGERS ST
CAMBRIDGE, MA 02142

CONTRACT NUMBER:

DR JAMES R DOWNER

TITLE:

CRYOGENICALLY-COOLED MAGNETIC JOURNAL BEARINGS

TOPIC# 5 OFFICE: IDENT#: 572

LIQUID-HYDROGEN-COOLED, SPACE-BASED ROTATING MACHINERY FOR SPACE POWER GENERATION POSES SEVERE DESIGN CONSTRAINTS WHICH CANNOT BE MET BY MECHANICAL BEARINGS. MECHANICAL BEARINGS REQUIRE LUBRICATION WHICH WILL BE DIFFICULT, IF NOT IMPOSSIBLE, TO SUPPLY AT A TEMPERATURE OF 20 DEGREES KELVIN. SUCH MACHINES ALSO WILL BE PRONE TO VIBRATION, LARGE ANGULAR MOMENTUMS, AND THEIR ASSOCIATED STRESS PROBLEMS WHICH RESULT FROM ROTOR IMBALANCE, PARTICULARLY NEAR CRITICAL SPEEDS. SUPPORTING THIS MACHINERY IN MAGNETIC BEARINGS WOULD ADDRESS BEARING PROBLEMS AT THEIR SOURCE. MAGNETIC BEARINGS REQUIRE NO LUBRICANT, CAN USE LIQUID HYDROGEN AS A COOLANT FOR THE CONTROL COILS (INCREASING CONDUCTIVITY AND OFFERING REDUCED OHMIC LOSSES) AND ARE ANTICIPATED TO AUTONOMOUSLY MANAGE THE ANGULAR MOMENTUM AND TO ATTENUATE VIBRATION INPUTS TO THE SPACECRAFT. THIS IS EXPECTED TO ALLOW GREATER LINE-OF-SIGHT PRECISION AND REDUCES THE NEED FOR A SEPARATE VIBRATION ISOLATION SYSTEM. IN THE PREVIOUS RESEARCH PHASE, THE POTENTIAL WAS SHOWN FOR MULTIPLE ORDER-OF-MAGNITUDE REDUCTIONS IN TRANSMITTED MACHINERY VIBRATION BY USING ACTIVELY-CONTROLLED MAGNETIC BEARINGS RATHER THAN CONVENTIONAL BALL OR ROLLER MECHANICAL BEARINGS. IN THE CURRENT RESEARCH EFFORT, FIFTH-SCALE (2600 LB., 40 MW) LABORATORY-SIZE MODEL OF CRYOGENICALLY-COOLED MAGNETIC BEARINGS IN A CRYOGENIC ALTERNATOR APPLICATION IS BEING EVALUATED AND

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CONFIDENCE FOR SCALING TO A SIZE APPROPRIATE FOR LATER ENGINEERING MACHINERY MAGNETIC BEARINGS, WHEN DEMONSTRATED, WILL IMPROVE THE EFFICIENCY OF THE CRYOGENIC COOLERS AND, THEREFORE, THE ECONOMICS OF LOW-TEMPERATURE SUPERCONDUCTORS SUCH AS NIOBIUM-TITANIUM IN PRODUCT SUCH AS MAGNETIC RESONANCE IMAGING MAGNETS.

SCIENCE RESEARCH LAB INC

15 WARD ST

SOMERVILLE, MA 02143

CONTRACT NUMBER:

ROBERT E KLINKOWSTEIN

TITLE:

EXPANDING FLOW PLASMA SOURCE FOR HIGH BRIGHTNESS NEGATIVE DEUTERON BEAMS

TOPIC# 1

OFFICE:

IDENT#: 581

THE SDIO NEUTRAL PARTICLE BEAM (NPB) PROGRAM NEEDS LOW EMITTANCE, HIGH BRIGHTNESS NEGATIVE ION SOURCES. THE GOALS OF THE NEGATIVE ION SOURCE RESEARCH PROGRAM ARE TO PRODUCE A CW, LOW EMITTANCE, HIGH CURRENT ION SOURCE CAPABLE OF AUTOMATED OPERATION FOR SEVERAL MINUTES. PHASE II WILL EXPERIMENTALLY INVESTIGATE THE TECHNICAL FEASIBILITY OF THE HIGH DENSITY EXPANDING FLOW D- ION SOURCE. A PROTOTYPE NEGATIVE ION SOURCE WILL BE FABRICATED AND EXPERIMENTS WILL BE PERFORMED TO CHARACTERIZE ITS OPERATION AND COMPARE ITS PERFORMANCE WITH PREDICTED RESULTS. THE EXPANDING FLOW D- ION SOURCE UNDER INVESTIGATION IS A CONTINUOUS OPERATION, HIGH BRIGHTNESS NEGATIVE ION SOURCE WHICH RELIES ON HIGH DENSITY VOLUME PRODUCTION OF D- IONS. THE SOURCE ACHIEVES HIGHER BRIGHTNESS BY UTILIZING A HIGH DENSITY CW DISCHARGE (10^{13} - 10^{14} cm⁻³) TO PRODUCE D- IONS BY DISSOCIATIVE ATTACHMENT AT A DENSITY WHICH IS APPROXIMATELY TEN TIMES GREATER THAN THE CONVENTIONAL VOLUME SOURCES. THE HIGH DENSITY EXPANDING FLOW NEGATIVE ION SOURCE CAN, IN PRINCIPLE, PRODUCE A CW SOURCE OF NEGATIVE DEUTERIUM IONS WITH A PREDICTED BRIGHTNESS EXCEEDING THOSE OF EXISTING VOLUME SOURCE BY A FACTOR OF TEN.

SCIENTIFIC RESEARCH ASSOCS INC

PO BOX 1058 - 50 NYE RD

GLASTONBURY, CT 06033

CONTRACT NUMBER:

HAROLD L GRUBIN

TITLE:

SIMULATION DESIGN FABRICATION AND TESTING OF A SINGLE CRYSTAL...

TOPIC# 14

OFFICE:

IDENT#: 584

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SEMICONDUCTING DIAMOND FIELD EFFECT TRANSISTORS (FET) ARE NEARLY IDEAL FOR HIGH SPEED, HIGH POWER, HIGH TEMPERATURE, RADIATION RESISTANT DEVICES. THIS PROGRAM WILL BUILD AND TEST SUCH A DEVICE, BY GROWING A SINGLE CRYSTAL P-DOPED DIAMOND PROCESSED INTO POWER FETs. THE RESULTANT DEVICE WILL BE CHARACTERIZED THROUGH A SERIES OF ELECTRICAL MEASUREMENTS. A MANUFACTURING METHODOLOGY WILL ALSO BE INVESTIGATED, LEADING TO DEVELOPMENT OF A COMMERCIAL PRODUCT. DIAMOND FETs WILL HAVE EXTENSIVE APPLICATIONS IN THE ELECTRONICS AND COMMUNICATIONS INDUSTRIES, AND WILL BE PARTICULARLY VALUABLE WHERE POWER, TEMPERATURE, AND RADIANT MAY POSE A THREAT. COMMERCIAL AND MILITARY SATELLITES ARE PRIME USERS OF SUCH DEVICES.

SPACE COMPUTER CORP
2800 OLYMPIC BLVD - STE 104
SANTA MONICA, CA 90404

CONTRACT NUMBER:

WILLIAM B KENDALL

TITLE:

OBJECT DISCRIMINATION VIA BULK TEMPERATURE/VELOCITY FILTERING

TOPIC# 3

OFFICE:

IDENT#: 598

THE PURPOSE OF THIS PROGRAM IS TO DEVELOP AND DEMONSTRATE A NEW APPROACH TO OBJECT ACQUISITION, TRACKING AND DISCRIMINATION WITH DATA FROM A PASSIVE IR SENSOR. THIS NEW BULK PROCESSING APPROACH UTILIZES DATA DIRECTLY FROM THE FOCAL PLANE ARRAY IN ORDER TO EXPLOIT THE MUCH HIGHER SAMPLING RATE AVAILABLE THERE FOR IMPROVED DETECTION AND DISCRIMINATION OF RAPIDLY-SCINTILLATING TARGETS. IT ALSO EMPLOYS VELOCITY FILTERING OF IMAGE SEQUENCES FOR IMPROVED SIGNAL-TO-NOISE RATIO, BACKGROUND SUPPRESSION AND TRACK ASSOCIATION AS WELL AS DISCRIMINATION BASED ON OBJECT MOTION CHARACTERISTICS AND LONG-TERM FLUCTUATION PROFILES. THE NEW APPROACH CAN SIGNIFICANTLY AUGMENT CURRENT APPROACHES IN TERMS OF BOTH PERFORMANCE AND HARDWARE REQUIREMENTS. IN THE PREVIOUS RESEARCH EFFORT, BASIC ALGORITHMS WERE DEVELOPED, AND ALTERNATIVE PROCESSOR ARCHITECTURES SUITABLE FOR THEIR EXECUTION WERE DEMONSTRATED. IN THE CURRENT RESEARCH EFFORT, ALGORITHM DEVELOPMENT AND ALGORITHM EXECUTION ON A LOW-COST, PROGRAMMABLE, FINE-GRAINED PARALLEL PROCESSOR ARE BEING INVESTIGATED. THIS PROCESSOR COULD BE IMPLEMENTED WITH VLSI/ULSI/WSI AND EXISTING

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PACKAGING TECHNOLOGY IN AN EXTREMELY COMPACT, LOW-POWER, RADIATION-HARD FORM FOR FLIGHT USE. THE NEW APPROACH COULD BE APPLIED TO A WIDE RANGE OF STRATEGIC DEFENSE SENSORS, INCLUDING BSTS, SSTS, AOS AND GBSS AS WELL AS TO FIRE CONTROL SYSTEMS FOR KINETIC AND DIRECTED ENERGY WEAPONS. IT WOULD ALSO BE APPLICABLE TO VARIOUS MILITARY RECONNAISSANCE, SURVEILLANCE AND INTELLIGENCE SYSTEMS, INCLUDING THOSE FOR CRUISE-MISSILE DETECTION, AS WELL AS COMMERCIAL ROBOTICS AND COMPUTER VISION SYSTEMS.

SPACE POWER INC
621 RIVER OAKS PKWY
SAN JOSE, CA 95134
CONTRACT NUMBER:
SEE-POK WONG

TITLE:

IMPROVED FLIGHT-TYPE ARCJET POWER CONDITIONER

TOPIC# 6

OFFICE:

IDENT#: 599

IN THE CURRENT RESEARCH EFFORT, THE DESIGN, CONSTRUCTION, AND TESTING OF AN IMPROVED FLIGHT-TYPE POWER CONDITIONER UNIT (PCU) FOR CONTROLLING 30 kWe CLASS ARCJET THRUSTERS IS BEING INVESTIGATED. THE SUCCESSFUL COMPLETION WILL INCLUDE DEMONSTRATION OF A FULL-SCALE PCU CONTROLLING REPRESENTATIVE HIGH POWER ARCJET THRUSTERS THROUGH BOTH STARTUP TRANSIENTS AND LONG DURATION, STEADY-STATE OPERATION. THE PCU WILL INCORPORATE SEVERAL IMPORTANT INNOVATIONS FOR STARTUP TRANSIENT CONTROL AND RELIABLE, EFFICIENT STEADY-STATE OPERATION. THE COMPONENTS COMPRISING THE PCU ARE APPROPRIATE TO EVENTUAL PACKAGING INTO A LIGHTWEIGHT, HIGHLY EFFICIENT, COMPACT FLIGHT QUALIFIED CONFIGURATION. THIS IS INTENDED TO LEAD DIRECTLY TO THE COMMERCIALIZATION OF THE PCU, DEVELOPMENT OF IMPROVED STARTUP CIRCUITRY, CONSTRUCTION AND TESTING OF AN IMPROVED PCU WHICH INCORPORATES THE STARTUP CIRCUITRY AND OTHER EVOLUTIONARY IMPROVEMENTS, AND TRANSIENT AND STEADY STATE TESTING OF THE PCU WITH REPRESENTATIVE HIGH POWER ARCJET THRUSTERS. HIGH POWER ARCJET THRUSTERS AND THE ASSOCIATED POWER CONDITIONING AND REGULATION ARE EXPECTED TO HAVE COMMERCIAL APPLICATION IN THE FUTURE AS LARGER SATELLITES USING ELECTRIC PROPULSION FOR ORBIT TRANSFER ARE LAUNCHED. ALSO, LOW POWER ARCJETS MAY HAVE A NEAR-TERM MARKET FOR NORTH/SOUTH STATION KEEPING IN GEO. THE TECHNOLOGY OF THIS PROPOSED PROJECT WILL BE DIRECTLY APPLICABLE

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TO BOTH CLASSES OF THRUSTERS.

SPACE POWER INC
621 RIVER OAKS PKWY
SAN JOSE, CA 95134
CONTRACT NUMBER:
JOHN L LAWLESS
TITLE:
NEW EFFICIENT SHORT WAVELENGTH HIGH POWER SPACE BASED LASER
TOPIC# 1 OFFICE: IDENT#: 600

THIS RESEARCH ADDRESSES THE NEED FOR HIGH-POWER SHORT-WAVELENGTH EFFICIENT LOW-MASS SPACE-BASED LASERS FOR SDI. TO DO THIS, A CLASS OF POTENTIAL IONIZED EXCIMER (EXIONIMER) LASERS WILL BE INVESTIGATED. THE OBJECTIVE OF THE PHASE II RESEARCH IS TO DEMONSTRATE ONE OR MORE OF THESE LASERS IN THE LABORATORY. WAVELENGTHS RANGING FROM UV TO X-RAYS ARE CHARACTERISTIC OF IONIZED EXCIMERS. SHORT WAVELENGTHS ALLOW TIGHTER FOCUSING OVER LONGER DISTANCES. THIS MAKES AN EXIONIMER SBL POTENTIALLY MORE LETHAL OVER LONGER RANGES. THIS ALSO MEANS THAT LESS POWER IS NEEDED FOR THE SAME LETHALITY AND RANGE AS FOR LONGER WAVE LASERS. THE FORMATION KINETICS OF EXIONIMERS APPEARS TO BE SIMPLY THAN FOR CONVENTIONAL EXCIMER LASERS AND THIS IS EXPECTED TO LEAD TO HIGHER EFFICIENCIES. ANOTHER IMPORTANT FEATURE OF EXIONIMER TYPE LASERS IS THE POTENTIAL FOR HIGH HEAT REJECTION TEMPERATURE IS MISSION ENABLING FOR CLOSED-CYCLE DEW PLATFORMS. ALSO, THE POTENTIAL EXIONIMER LASERS ARE CAPABLE OF PULSED OPERATION WITH HIGH PULSE ENERGIES AND SHORT PULSE DURATIONS. THIS IS MORE LETHAL THAN CONTINUOUS WAVE (CW) LASERS. IF THE NEW CLASS OF LASERS ARE SUCCESSFUL, IT WILL MAKE SATELLITES NEEDED FOR STRATEGIC MISSILE DEFENSE MUCH LIGHTER AND HENCE LESS EXPENSIVE. SMALLER VERSIONS OF THESE LASERS HAVE POTENTIAL TERRESTRIAL COMMERCIAL APPLICATIONS IN LASER CUTTING, WELDING, MATERIALS PROCESSING, AND PHOTOLITHOGRAPHY. THE LASERS ARE EXPECTED TO EMIT IN THE UV/VUV/XUV RANGE. THE SYSTEMS HAVE THE POTENTIAL TO BE THE FIRST ELECTRICALLY EXCITED XUV LASERS. EXIONIMER LASERS ARE EXPECTED TO HAVE MUCH GREATER RUGGEDNESS, COMPACTNESS, AND EFFICIENCY THAN OTHER XUV LASERS.

SPACE POWER INC
621 RIVER OAKS PKWY
SAN JOSE, CA 95131
CONTRACT NUMBER:
DR H S RHEE
TITLE:
SURVIVABLE LOW POWER LOW COST SPACE POWER UNIT
TOPIC# 4 OFFICE: IDENT#: 601

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A ZIRCONIUM HYDRIDE MODERATED IN-CORE THERMIONIC REACTOR CAN PROVIDE A LOW COST STABLE, SURVIVABLE POWER SOURCE FOR SPACE. THIS PROJECT IS DEMONSTRATING THE DEVICES TO MAKE SUCH A REACTOR POSSIBLE. THE CONTAINMENT OF HYDROGEN FROM ZIRCONIUM HYDRIDE AT 800 TO 900 K SHOULD BE INCREASED 10 TO 100 TIMES OVER THAT EVER ACHIEVED BEFORE TO DEBRIS AS WELL AS HOSTILE THREATS SUCH AS GROUND AND SPACE-BASED MAINTAIN THE LONG TERM HYDROGEN LOSS AND SUBSEQUENT HYDROGEN MIGRATION FROM THE MODERATOR TO THE THERMIONIC ELEMENT CESIUM RESERVOIRS TO ACCEPTABLE LEVELS. IN ORDER TO RELIABLY ACHIEVE THE DESIRED LOW HYDROGEN LOSS RATE, A UNIQUE MULTI-LAYERED METAL/CERAMIC HYDROGEN BARRIER AND PRESSURE CONTROL TECHNIQUE ARE BEING DEMONSTRATED EXPERIMENTALLY. THIS DEVELOPMENT WILL ENABLE A LOW COST, LOW MASS, 6 TO 30 kWe SPACE POWER SYSTEM FOR ECONOMIC DELIVERY OF HIGH POWER COMMUNICATION AND RADAR SATELLITES. THE UNIQUE HYDROGEN STORAGE SCHEME MAY BE SUITABLE FOR A VARIETY OF HIGH PRESSURE GAS STORAGE CONTAINERS, TANK TRUCKS, AND RAIL CARS.

SPACE TECH CORP
2324 MANCHESTER CT
FORT COLLINS, CO 80526

CONTRACT NUMBER:

DR MICHAEL ANDREWS

TITLE:

META COMPILER FOR VERY HIGH LEVEL LANGUAGE IN BATTLE MANAGEMENT
TOPIC# 10 OFFICE: IDENT#: 136

THIS COMPILER USES AN INTERMEDIATE LANGUAGE AND A DEFINITION OF THE TARGET COMPUTER ARCHITECTURE TO ALLOW VIRTUALLY ANY HIGH LEVEL LANGUAGE TO BE TRANSLATED ONTO ANY MACHINE. THE META COMPILER USES SEVERAL TECHNIQUES TO TRANSLATE AND OPTIMIZE CODE, INCLUDING ARTIFICIAL INTELLIGENCE GRAPH COLORING, AND CACHEING OF MACHINE INSTRUCTIONS. THIS UNIQUE ABILITY OF RE-TARGETING SHORTENS THE TIME REQUIRED TO PROGRAM SOFTWARE FOR A NEW ARCHITECTURE. IT ALSO ALLOWS FOR A TOOL TO TEST NEW ARCHITECTURE DESIGNS BEFORE THEY ARE CONSTRUCTED, AND IT PROVIDES VASTLY IMPROVED CODE OPTIMIZATION FOR NON-VON MACHINES. THE TECHNIQUE HAS MANY POTENTIAL APPLICATIONS IN DESIGNING NEW COMPUTER ARCHITECTURES, AND PROVIDING A SINGLE COMPILER FOR MANY COMPUTERS. THE META COMPILER SPEEDS UP COMPILER GENERATION

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OF VERY DIFFICULT BIT SLICE ARCHITECTURES SUCH AS THE BIT 3130. TYPICAL GENERATION TIME IS CUT IN HALF USING A SIMPLE MACHINE DESCRIPTION LANGUAGE. PARALLEL AND VECTOR ARRAY ARCHITECTURE ARE EASILY TARGETED BECAUSE THE META COMPILER HAS STANDARD AUTO-PARALLELING AND VECTORING CONSTRUCTS. GREATER FLEXIBILITY IS ACHIEVED BY THE VERSATILE FRONTEND SO ADAPTABILITY TO SEVERAL SOURCE LANGUAGE IS TRIVIAL.

SPARTA INC
23041 AVENIDA de la CARLOTA
LAGUNA HILLS, CA 92653
CONTRACT NUMBER:
GEORGE A LESIEUTRE
TITLE:
HIGH DAMPING GRAPHITE FIBER
TOPIC# 13 OFFICE:

IDENT#: 137

THE DEVELOPMENT OF HIGH DAMPING GRAPHITE FIBERS AND THEIR USE IN STRUCTURAL COMPOSITE MATERIALS WILL ENABLE PRECISION STRATEGIC DEFENSE AIRCRAFT TO HAVE AN ORDER OF MAGNITUDE IN PASSIVE STRUCTURAL DAMPING OVER CURRENT LEVELS. IF GRAPHITE-REINFORCED COMPOSITE MATERIALS, ALREADY OF GREAT UTILITY BECAUSE OF SUPERIOR MECHANICAL AND THERMAL PROPERTIES, CAN ALSO BE TAILORED TO PROVIDE HIGH INTRINSIC DAMPING, SIGNIFICANT SPACECRAFT PERFORMANCE GAINS CAN BE REALIZED. THE PHASE II ADDRESSES THE MATERIALS AND STRUCTURES RESEARCH AND DEVELOPMENT NEEDED TO ACHIEVE THIS GOAL. PHASE I SHOWED FEASIBILITY OF DEVELOPING A HIGH DAMPING GRAPHITE FIBER BY MEASUREMENTS MADE ON EXPERIMENTAL FIBERS. WITH NO ATTEMPT AT OPTIMIZATION WHATEVER, TREATED (INTERCALATED) FIBERS EXHIBITED DAMPING LEVELS MORE THAN THOSE OF BASELINE COMMERCIAL FIBERS. TRADEOFFS WITH OTHER IMPORTANT MATERIAL DESIGN PROPERTIES WERE IDENTIFIED FOR THESE TREATED FIBERS AND FOUND TO BE ACCEPTABLE. IN PHASE II, THE PROCESS WILL BE OPTIMIZED. THE RESULTING HIGH DAMPING FIBERS WILL BE USED TO DEVELOP A PROTOTYPICAL HIGH DAMPING STRUCTURAL COMPOSITE MATERIAL. THIS MATERIAL WILL BE DEMONSTRATED IN THE FORM OF A SIMPLE STRUCTURAL ELEMENT WITH RELEVANCE TO A SPECIFIC SDI SPACECRAFT, AND THE PAYOFFS OF THE DAMPING SO ACHIEVED WILL BE QUANTIFIED. PHASE II WILL ADDRESS: 1) THE TRANSLATION OF HIGH FIBER DAMPING INTO HIGH COMPOSITE DAMPING; 2) THE THERMAL STABILITY OF THE FIBER TREATMENT,

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ESPECIALLY DURING COMPOSITE FABRICATION - CAN THESE FIBERS BE SUCCESSFULLY USED IN METAL MATRIX COMPOSITES?; 3) THE COMPATIBILITY OF THE TREATED FIBERS WITH TYPICAL MATRIX MATERIALS - CAN GOOD FIBER-MATRIX BONDING BE ACHIEVED?; 4) THE IDENTIFICATION OF POTENTIAL PROPERTY TRADES - CAN HIGH COMPOSITE DAMPING BE ACHIEVED WITHOUT SIGNIFICANT COMPROMISE TO OTHER KEY MATERIAL PROPERTIES?; 5) AND THE COMMERCIAL ADAPTABILITY OF THE FIBER TREATMENT PROCESS.

SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
CONTRACT NUMBER:
STANLEY M VERNON
TITLE:

DEPOSITION OF InP ON Si SUBSTRATES FOR MONOLITHIC INTEGRATION
OF ADVANCED ELECTRONICS
TOPIC# 14 OFFICE: IDENT#: 143

THE PROJECT WILL DEVELOP A PROCESS FOR THE HETEROEPITAXIAL GROWTH OF InP ON SILICON SUBSTRATES BY METALORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD). DUE TO ITS HIGH ELECTRON SATURATED DRIFT VELOCITY AND RADIATION RESISTANCE, InP IS AN EXCELLENT MATERIAL FOR USE IN HIGH-SPEED ELECTRONIC DEVICES AND SPACE APPLICATIONS. SILICON IS AN OPTIMAL SUBSTRATE MATERIAL DUE TO THE AVAILABILITY OF HIGH PURITY, LARGE AREA, LOW COST WAFERS. COMPARED TO InP, Si HAS VERY HIGH STRENGTH-TO-WEIGHT RATIO AND THERMAL CONDUCTIVITY. THE PROCESS WILL PROVIDE HIGH QUALITY, SINGLE CRYSTAL InP ON Si WHICH WOULD LEAD TO THE ESTABLISHMENT OF AN InP-ON-Si DEVICE TECHNOLOGY. PHASE I SINGLE-CRYSTAL FILMS OF InP WERE DEPOSITED ONTO Si SUBSTRATES AND CHARACTERIZED BY A NUMBER OF TECHNIQUES. AN INTERESTING FINDING IN THIS WORK WAS THAT THE USE OF A THIN GaAs INTERMEDIATE LAYER FACILITATES THE GROWTH OF HIGH-QUALITY InP FILMS ON Si WAFERS. THE PHASE II WILL OPTIMIZE THE InP/GaAs/Si GROWTH PROCESS, DEVELOP PROCEDURES FOR DEPOSITING LATTICE-MATCHED GaInAs LAYERS ONTO THE InP FILMS, AND DEMONSTRATE THE QUALITY OF THE InP AND GaInAs LAYERS BY THE FABRICATION AND CHARACTERIZATION OF SIMPLE DEVICE STRUCTURES. IN PHASE III, THIS TECHNOLOGY WILL BE COMMERCIALIZED BY SPIRE VIA THE SALE OF EPITAXIAL WAFERS AND MOCVD REACTOR-TECHNOLOGY TRANSFER PACKAGES.

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SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
CONTRACT NUMBER:
DR PIRAN SIOSHANSI
TITLE:
MULTIPLE ION IMPLANTATION OF BURIED LAYERS FOR
SILICON-ON-INSULATOR
TOPIC# 14 OFFICE: IDENT#: 149

THIS PROGRAM HAS SHOWN THAT A MULTIPLE STEP ION IMPLANTATION PROCESS CAN PRODUCE THICK BURIED OXIDE OR DOUBLE BURIED OXIDE LAYERS. IN ADDITION, A MULTIPLE STEP LOW DOSE IMPLANTATION PROCESS CAN BE USED TO IMPROVE THE QUALITY OF BOTH THE OXIDE LAYER AND THE SILICON TOP LAYER. EFFORTS ARE CONTINUING TO SYSTEMATICALLY STUDY THE EFFECT OF THE MULTI-STEP PROCESS CONDITIONS ON REDUCING THE DEFECT DENSITY IN THE SILICON LAYER AND TO PRODUCE SIMOX WITH VERY THICK OR MULTIPLE BURIED OXIDE LAYERS. IMPLANTATION, ANNEALING, AND EPITAXY PROCESSES ARE BEING REFINED TO PRODUCE OPTIMUM QUALITY SIMOX STRUCTURES. WHEN SUCCESSFUL, A MULTI-STEP PROCESS CAN PRODUCE SIMOX SUBSTRATES TO PROVIDE FOR RADIATION HARDENING HIGH SPEED ELECTRONIC DEVICES FOR USE IN SPACE OR IN CRITICAL TERRESTRIAL COMMUNICATIONS.

TECHNO-SCIENCES (OLD: SYS ENGINEERING)
7833 WALKER DR - STE 308
GREENBELT, MD 20770
CONTRACT NUMBER:
WILLIAM H BENNETT
TITLE:
CONTROLLERS FOR SPACE STRUCTURES
TOPIC# 12 OFFICE: IDENT#: 636

DEVELOP AN INTEGRATED ENGINEERING WORKSTATION PACKAGE FOR DESIGN AND TESTING OF ADVANCED REAL TIME CONTROLLERS FOR FLEXIBLE SPACE STRUCTURE CONTROL. TYPICAL APPLICATIONS ARE VIBRATION SUPPRESSION AND ISOLATION OF PAYLOAD SUBSYSTEMS ESPECIALLY FOR SPACE BASED

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OPTICAL SYSTEMS. THE SOFTWARE PACKAGE WILL INTEGRATE ADVANCED COMPUTATIONAL ALGORITHMS FOR CONTROL LAW DESIGN BASED ON SAMPLING AND INTERPOLATION OF CERTAIN SYSTEM FREQUENCY RESPONSES TOGETHER WITH A FACILITY FOR DEVELOPING AND TESTING VARIOUS ADVANCED AND INNOVATIVE REAL TIME CONTROL IMPLEMENTATIONS BASED ON STATE-OF-THE-ART VLSI TECHNOLOGY AND MODERN DIGITAL SIGNAL PROCESSING. A PRINCIPAL INNOVATION TO BE DEMONSTRATED IS THE APPLICATION OF ADVANCED, SPECIAL PURPOSE COMPUTER ARCHITECTURES (DEVELOP FOR REAL TIME SIGNAL PROCESSING APPLICATIONS) FOR REAL TIME CONTROL. SUCH PROCESSORS-CALLED DIGITAL SIGNAL PROCESSING (DSP) CHIPS ARE NOW READILY AVAILABLE AS OFF-THE-SHELF ITEMS AND APPEAR AS THE PROCESSOR ON DATA ACQUISITION AND PROCESSING BOARDS COMPATIBLE WITH SEVERAL STANDARD PC'S. THE PROJECT WILL SHOW FEASIBILITY OF IMPLEMENTING THE REAL TIME CONTROL COMPUTATIONS FOR VARIOUS FLEXIBLE STRUCTURE CONTROL PROBLEMS VIA FINITE IMPULSE RESPONSE (FIR) FILTER BASED IMPLEMENTATIONS.

TETRA CORP
4905 HAWKINS ST NE
ALBUQUERQUE, NM 87109
CONTRACT NUMBER:
DR E W GRAY
TITLE:
MICROSTACK INSULATOR FOR HIGH VOLTAGE PULSED SYSTEMS
TOPIC# 5 OFFICE: IDENT#: 645

TO BRING THE VALUE OF THE VACUUM SURFACE FLASHOVER ELECTRIC FIELD TO LEVELS COMPARABLE TO THE DIELECTRIC BULK STRENGTH OF THE INSULATOR WILL REPRESENT A MAJOR BREAKTHROUGH IN INSULATION TECHNOLOGY. THE ACHIEVEMENT OF THIS MILESTONE IS BASED ON THE UNDERSTANDING OF THE PHYSICS RESPONSIBLE FOR SURFACE FLASHOVER. TETRA'S MICROSTACK APPROACH RESOLVES TWO OF THE BASIC PHYSICAL MECHANISMS RESPONSIBLE FOR SURFACE FLASHOVER (TRIPLE POINT ENHANCEMENT, SURFACE CHARGING, ULTRAVIOLET INITIATED ELECTRON AVALANCHE, INSULATOR SURFACE DEFECTS, ETC.). THESE ARE: SURFACE CHARGING AND SUPPRESSION OF ELECTRON AVALANCHING AT INTERMEDIATE POINTS OF THE INSULATOR. DEVELOPMENT OF THE MICROSTACK TECHNOLOGY WILL REDUCE THE SIZE OF PARTIAL ACCELERATOR AND ELECTRON BEAM DIODES, THUS, CONTRIBUTING TO LOWER WEIGHT, MORE COMPACT FOR EASIER DEPLOYMENT IN SPACE. POTENTIAL COMMERCIAL

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OPPORTUNITIES ARE WIDE OPEN IN MICROELECTRONICS APPLICATIONS, SCANNING ELECTRON MICROSCOPES AND X-RAY MACHINES, BY REDUCING THE SIZE, WEIGHT AND THE INDUCTANCE OF THE OVERALL SYSTEMS. THE MOST EXCITING APPLICATIONS FOR THE MICROSTACK TECHNOLOGY ARE FOR SPACE-BASED PULSED POWER AND HIGH VOLTAGE DEVICES. BY REDUCING THE WEIGHT AND INDUCTANCE OF THE REQUIRED VACUUM FLASHOVER STACKS, THE EFFICIENCY OF THE SYSTEM IS INCREASED BY A REDUCTION OF THE INDUCTIVE LOSSES AT THE GROUND RETURN. THE TECHNOLOGY WILL PROVIDE DESIGNERS AND PULSED POWER ENGINEERS THE POSSIBILITY TO REDUCE THE SIZE AND INCREASE THE EFFICIENCY OF SYSTEMS OPERATING WITH HIGH VOLTAGE, HIGH VACUUM, AND HIGH CURRENTS.

TETRA CORP
4905 HAWKINS ST NE
ALBUQUERQUE, NM 87109
CONTRACT NUMBER:
DR E W GRAY
TITLE:
HIGH POWER LOW IMPEDANCE LIGHT WEIGHT TRANSMISSION LINES
TOPIC# 5 OFFICE: IDENT#: 646

A PROGRAM FOR DEVELOPING A TECHNOLOGY BASE FOR LIGHTWEIGHT, TRANSMISSION LINE (LWTL) FOR PULSED POWER SYSTEMS FOR SPACE AND AIRBORNE APPLICATIONS IS BEING INVESTIGATED. IN PHASE I OF THE PROGRAM, THE FEASIBILITY OF THE CONCEPT OF USING SOLID DIELECTRIC TRANSMISSION LINES WAS DEMONSTRATED FOR 1MV/cm FIELDS AND 0.1-10 MICROSECOND DURATION. IN THE CURRENT RESEARCH EFFORT, THE LWTL TECHNOLOGY IS BEING DEVELOPED WITH THEORETICAL AND EXPERIMENTAL EFFORT CENTERED ON THREE AREAS OF CRITICAL IMPORTANCE. THESE ARE: SELECTING AND CHARACTERIZING HIGH INTRINSIC DIELECTRIC STRENGTH POLYMER MATERIALS, BOTH COMMERCIALY AVAILABLE AND UNDER DEVELOPMENT; DEVELOPING LOW INDUCTANCE COUPLING CONFIGURATIONS WITH MINIMUM FIELD ENHANCEMENT; AND SELECTING CONDUCTIVE COATINGS WITH LOW OUTGASSING PROPERTIES AND ARE RESISTANT TO SOLAR UV RADIATION. THE RESULTING LWTL DESIGN TECHNOLOGY IS ANTICIPATED TO WITHSTAND FIELDS IN EXCESS OF 1 MV/cm, FOR 0.1-10 MICROSECONDS WITH 1000 SHOT LIFE EXPECTANCY. THE RESULTS OF THE PHASE I AND II EFFORTS WILL LEAD DIRECTLY TO THE DEVELOPMENT OF THE TECHNOLOGY NEEDED TO DESIGN AND FABRICATE LIGHT WEIGHT DIELECTRIC TRANSMISSION LINES FOR PULSED POWER SYSTEM IN SPACE

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AND AIRBORNE APPLICATIONS. THE AVAILABILITY OF NEW TYPES OF DIELECTRIC MATERIALS WILL HAVE A SUBSTANTIAL IMPACT ON COMMERCIAL SYSTEMS INCLUDING INSULATORS, ENERGY STORAGE CAPACITORS, AND DEVICES FOR MICROCIRCUITS AND OTHER ELECTRONIC APPLICATIONS. THE AVAILABILITY OF SOLID DIELECTRIC PULSE-FORMING LINE, TECHNOLOGY THAT IS MAINTENANCE FREE, CAPABLE OF MANY SHOTS OF OPERATION WITHOUT DEGRADATION WILL ACCELERATE THE ACCEPTANCE IN INDUSTRY OF PULSED POWER SYSTEMS THAT USE PULSE-FORMING LINES TO PROVIDE HIGH PEAK POWERS FOR INDUSTRIAL PROCESSES.

ULTRAMET
12173 MONTAGUE ST
PACOIMA, CA 91331
CONTRACT NUMBER:
DR R H TUFFIAS
TITLE:
ULTRALIGHTWEIGHT HEAT TEMPERATURE STRUCTURAL MATERIALS
TOPIC# 2 OFFICE: IDENT#: 160

THE CHEMICALLY BOOSTED KINETIC KILL VEHICLE (KKV) IS A CRITICAL COMPONENT FOR STRATEGIC DEFENSE. NEW SYSTEMS, BASED ON ADVANCED SOLID PROPULSION CONCEPTS, TO MEET THE DEMANDING KKV DIVERT PROPULSION REQUIREMENTS CURRENTLY ARE BEING INVESTIGATED. WITH THE DEVELOPMENT OF THIS IMPORTANT TECHNOLOGY, SOLID PROPELLANT SYSTEMS WILL HAVE SIGNIFICANT ADVANTAGES OVER LIQUID SYSTEMS. OF FUNDAMENTAL IMPORTANCE IN THE SUCCESSFUL DEVELOPMENT OF LIGHTWEIGHT SOLID PROPULSION SYSTEMS FOR KKV DIVERT AND ATTITUDE CONTROL IS THE NEED FOR ADVANCED MATERIALS AND THEIR ADAPTATION TO SUCH SYSTEMS. THESE MATERIALS MUST BE STRONG, ULTRALIGHTWEIGHT, ABLE TO OPERATE ABOVE 4500 DEGREES FAHRENHEIT (2480 DEGREES CELSIUS), AND MINIMALLY REACTIVE AND CORROSION-RESISTANT IN AN OXIDIZING ENVIRONMENT. IN PHASE I, ULTRAMET DEMONSTRATED THAT A MATERIAL CAN BE FABRICATED BY CHEMICAL VAPOR DEPOSITION (CVD) WHICH WILL MEET THESE PERFORMANCE REQUIREMENTS. IN THIS PHASE II PROGRAM, ULTRAMET PROPOSES TO DEFINE THE PROCESS FOR PRODUCING THIS MATERIAL AND EVALUATE MODEL, AND CHARACTERIZE IT. THE SUCCESSFUL CONCLUSION OF THIS PROGRAM WILL RESULT IN THE DEVELOPMENT OF ULTRALIGHTWEIGHT HIGH TEMPERATURE OXIDATION-RESISTANT MATERIALS AND PROCESSES TO SUPPORT CONTINUED DEVELOPMENT OF THE KKV.

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XON-TECH INC
6862 HAYVENHURST AVE
VAN NUYS, CA 91406
CONTRACT NUMBER:
THEODORE D FAY
TITLE:
INFRARED SENSOR CALIBRATION TECHNIQUES AND STANDARDS
TOPIC# 3 OFFICE: IDENT#: 501

INFRARED SENSORS NEED SIMPLE BUT ACCURATE CALIBRATION SENSOR SUPPORTING MORE ACCURATE AND HIGH SPECTRAL RESOLUTION MEASUREMENTS. THE CONSTRUCTION OF A WIDEBAND SPECTROMETER THAT WILL SIMULTANEOUSLY MEASURE MOST OF THE 4-20 MICROSECONDS SPECTRUM WITH A SPECTRAL RESOLUTION OF λ DIVIDED BY $\Delta \lambda > 1000$ IS A HIGH RISK/HIGH PAYOFF PROJECT WITH MANY REMOTE SENSING AND DOD APPLICATIONS. THE GOAL FOR THE SENSOR IS RADIOMETRIC INTENSITY ACCURACY OF 1-3% HAS NOT BEEN ACHIEVED TO DATE. THIS IS A NOVEL SENSOR FOR RECORDING PRISM/ECHELLE CROSS DISPERSED SPECTRA OVER AN EXTREMELY WIDEBAND USING BOTH DIMENSIONS OF A TWO DIMENSIONAL ARRAY TO DRAMATICALLY INCREASE SPEED, RESOLUTION WAVELENGTH COVERAGE AND ACCURACY. IT WILL ENABLE THE CROSS CALIBRATION OF EXISTING GROUND CHAMBERS SUCH AS PORTABLE OPTICAL SENSOR TESTER (PSOT) AND ADVANCED SENSOR EVALUATION AND TEST (ASET) AND THE LINKING OF THESE CHAMBER CALIBRATIONS WITH THE STELLER IR STANDARDS. THE CALIBRATION SENSOR WILL BE SUFFICIENTLY COMPACT TO FLY ON AN AIRCRAFT SUCH AS OAMP OR AN RPV PLATFORM AND WILL FURTHER THE UNDERSTANDING OF THE IMPACT OF ATMOSPHERIC EFFECT ON ABSOLUTE SENSOR CALIBRATION.

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TOTAL NUMBER OF AWARDS: 59